Nokia Customer Care

Service Manual

RM-86 (Nokia 5500)
Mobile Terminal
Part No: 9252296 (Issue 1)

COMPANY CONFIDENTIAL

Amendment Record Sheet

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IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- During testing never activate the GSM transmitter without a proper antenna load, otherwise GSM PA may be damaged.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

Company Policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

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- Title of the Document + Issue Number/Date of publication
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- Page(s) and/or Figure(s) in error

Please send to:

NOKIA CORPORATION

Nokia Mobile Phones Business Group

Nokia Customer Care

PO Box 86

FIN-24101 SALO

Finland

E-mail: Service.Manuals@nokia.com

Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Ni-Cd/NiMh batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77° F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Nokia 5500 Service Manual Structure

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2 Parts Lists and Component Layouts
3 Service Software Instructions
4 Service Tools and Service Concepts
5 Disassembly / Reassembly Instructions
6 BB Troubleshooting and Manual Tuning Guide
7 RF Troubleshooting and Manual Tuning Guide
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9 System Module
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1 — General Information

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RM-86 product selection

Nokia RM-86 is a triband mobile phone supporting 900/1800/1900 MHz bands. RM-86 will support EGPRS packet data connection (EDGE) in all these bands. Supported multislot class for both GPRS and EGPRS is MSC 10. RM-86 is based on G3.1S, RAP GSM engine.

According to GSM standard 05.05 it responds to class 4 (max. 2W) in EGSM 900, class 1 (1W) in GSM 1800 and class 1 in GSM 1900. It also supports Bluetooth 2.0 standard. The handset has a full phase 2 Type Approval and it complies with the GSM Type Approval. RM-86 also has a full CE approval and FCC approval.

Phone has 2 megapixel camera with digital zoom up to 4x. Display resolution is 208 x 208 pixels and supports 262k colours.

RM-86 has a stereo FM radio and music player, and supports microSD card.

The MMS implementation follows the OMA MMS 1.2, AMR and SMIL.

WAP 2.0 compatible XHTML browser over HTTP/TCP/IP stack communicates with a gateway in network.

The supported UI is S60.

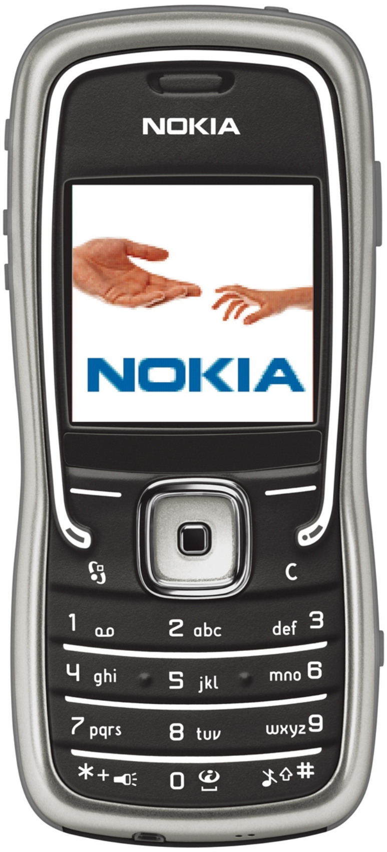

Figure 1 View of RM-86

RM-86 product features and sales package

Music

- Managing music and playlists with the music player (MP3/eAAC+) and controlling it with dedicated music keys
- Music transfer from PC to phone with Nokia Audio Manager, Windows Media Player, or other PC software
- Enhanced music features: audio settings (equalizer, stereo widening, reverb, bass boost)
- 3.5 mm connector jack in the headset cable

- Playlists sharing over Bluetooth, MMS, or email
- Memory expandable up to 1GB
- Formats supported: eAAC+, AAC+, M4A, MPEG-4 ACC LC, LTP,, MP3, AMR-NB, AMR-WB, 64 polyphonic MIDI, RealAudio Voice, RealAudio7, RealAudio8, RealAudio10, WMA
- Tunes Studio
- Visual Radio

Imaging

- Integrated 2-megapixel digital camera (1600 x 1200 default image size)
- Advanced camera modes: Still, burst, video
- Options for night, brightness adjustment, image quality, and self-timer
- 4x digital zoom
- Video resolution: 176x144 or 128x96 pixels (QCIF or SubQCIF), 15 frames per second
- Video services: Video capture up to 1 hour with microSD card; download, view, streaming

Bearers & transport

- Tri-band GSM coverage on up to five continents (GSM/EDGE 900/1800/1900)
- Automatic switching between bands

Software platform

- Series 60 Platform on Symbian operating system

Connectivity

- Bluetooth wireless technology
- Talk handsfree with a wireless Bluetooth headset enhancement
- Play wireless multiplayer games over a Bluetooth connection
- Synchronize your phone and compatible PC over a local Bluetooth wireless connection
- USB 2.0 full-speed with mass storage profile

Personal Information Management (PIM)

- Phonebook
- Calendar
- Notepad
- World clock
- Converter
- Calculator
- File manager
- Remote synchronization
- Active idle
- Messaging
- Browsing
- Platform security:
- Device integrity (no tampering of binaries and device settings)

- End-user privacy (protected access to contacts, calenda, messages)
- Controlling the access to sensitive operations or APIs, such as protecting network connections)

Sales package

- Transceiver RM-86
- BL-5B Battery Cell
- Compact Charger
- Charger Adapter
- User Guide, Quick guide
- CD-ROM (includes Nokia PC Suite software)
- Music Headset HS-29
- Connectivity Cable CA-53
- MicroSD card (64-512MB)
- Add-on application guide

Product and module list

Module name	Type code	Notes
System/RF Module	1MZ	Main PWB with components.
Side key flex	1RK	PWR key, side keys and flashlight.
UI PWB	1ND	Keyboard and illumination.

Mobile enhancements

Table 1 Audio

Enhancement	Type
Activity headset	HS-8
Boom mono headset	HDB-4
Mono headset	HS-5
Music headset	HS-20 + AD-41
Stereo headset	HS-23
Loopset	LPS-4
TTY adapter	HDA-10
Wireless headset	HDW-3
	HS-4W
	HS-11W
	HS-13W
	HS-26W
	HS-36W
	HS-37W

Enhancement	Type
Wireless clip-on headset	HS-21W
Music stand	MD-1

Table 2 Car

Enhancement	Type
Nokia car kit phone	N616
Headrest handsfree	BHF-3
Advanced car kit (sales pack) (EURO 1)	CK-7W
Wireless car kit	CK-1W
Plug-in car handsfree	HF-3
Wireless plug-in car handsfree	HF-6W
Mobile charger	DC-4
Nokia Universal holder (no charging support)	CR-39

Table 3 Data

Enhancement	Type
Connectivity cable	CA-53
Wireless GPS module	LD-1W

Table 4 Imaging

Enhancement	Type
Nokia remote camera	PT-6

Table 5 Messaging

Enhancement	Type
Wireless keyboard	SU-8W
Digital pen	SU-1B

Table 6 Power

Enhancement	Type
Compact charger	AC-3
Battery Li-Ion	BL-5B
Travel charger	AC-4
Charger adapter	CA-44

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T)	Weight (g)	Volume (cm^3)
Transceiver with BL-5B battery	107 x 45 x 18 mm	103	77

Main RF characteristics for triple-band (EGSM900/1800/1900 and GSM1800/1900) and EDGE phones

Parameter	Unit
Cellular systems	EGSM900, GSM1800/1900
Rx frequency band	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
Tx frequency band	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
Output power	EGSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
EDGE output power	EDGE900: +5 ... +27dBm/3.2mW ... 0.5W
	EDGE1800: +0 ... +26dBm/1.0mW ... 0.4W
	EDGE1900:+0 ... +26dBm/1.0mW ... 0.4W
Number of RF channels	EGSM900: 174
	GSM1800: 374
	GSM1900: 299
Channel spacing	200 kHz
Number of Tx power levels	EGSM900: 15
	GSM1800, GSM1900: 16

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by	ECTEL Talk time	ECTEL Stand-by
BL-5B	860	2-4.5 hrs	7-10 days	up to 4.5 hrs	8 days

Charging times

AC-3	AC-4
Up to 2 hrs 20 min	Up to 1 hr 20 min

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

2 — Parts Lists and Component Layouts

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Exploded view

Exploded view

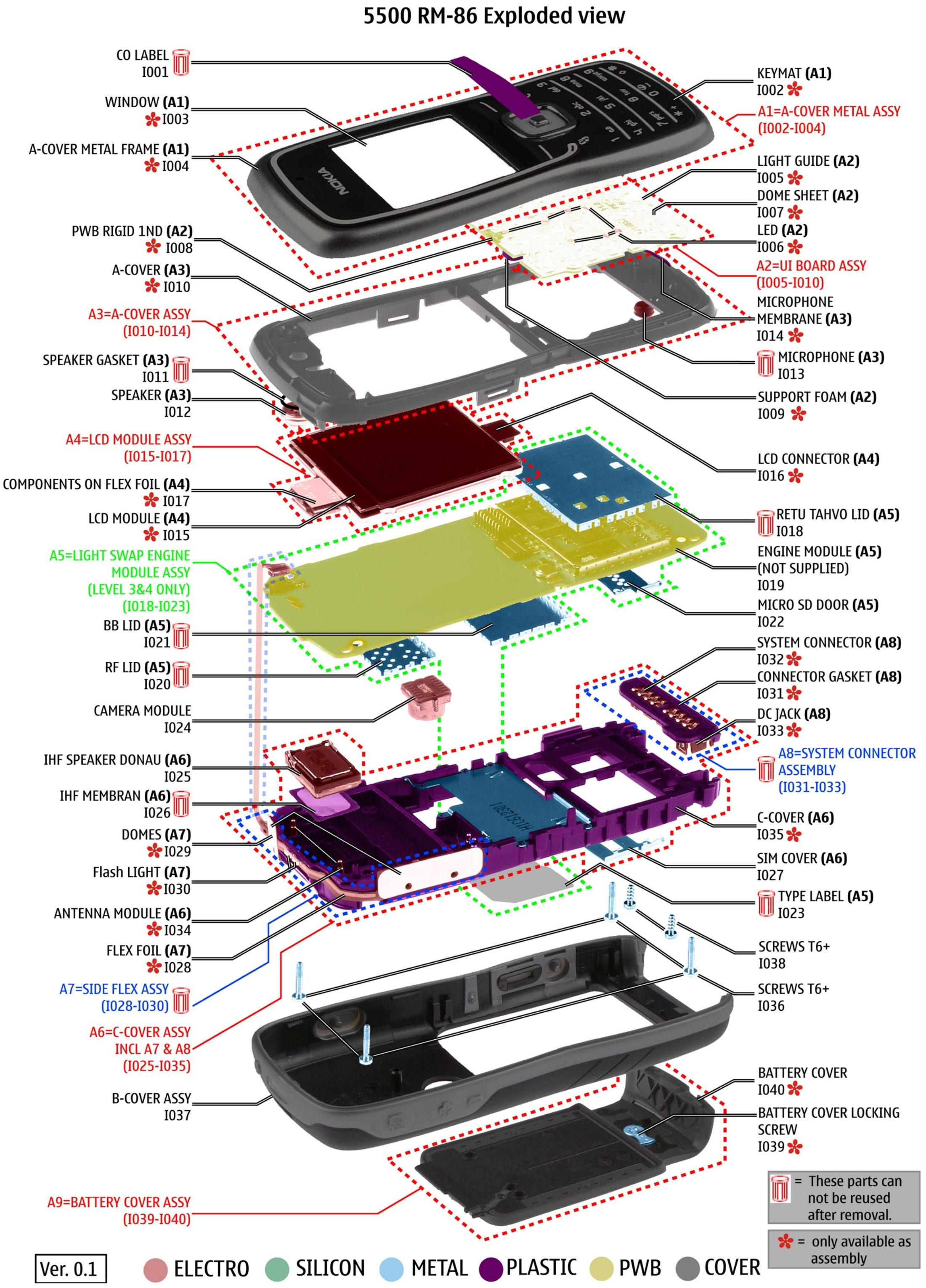

5500 RM-86 Exploded view
CO LABEL
I001
WINDOW (A1)
I003
A-COVER METAL FRAME (A1)
I004
PWB RIGID 1ND (A2)
I008
A-COVER (A3)
I010
A3=A-COVER ASSY
(I010-I014)
SPEAKER GASKET (A3)
I011
SPEAKER (A3)
I012
A4=LCD MODULE ASSY
(I015-I017)
COMPONENTS ON FLEX FOIL (A4)
I017
LCD MODULE (A4)
I015
A5=LIGHT SWAP ENGINE
MODULE ASSY
(LEVEL 3&4 ONLY)
(I018-I023)
BB LID (A5)
I021
RF LID (A5)
I020
CAMERA MODULE
I024
IHF SPEAKER DONAU (A6)
I025
IHF MEMBRAN (A6)
I026
DOMES (A7)
I029
Flash LIGHT (A7)
I030
ANTENNA MODULE (A6)
I034
FLEX FOIL (A7)
I028
A7=SIDE FLEX ASSY
(I028-I030)
A6=C-COVER ASSY
INCL A7 & A8
(I025-I035)
B-COVER ASSY
I037
A9=BATTERY COVER ASSY
(I039-I040)
KEYMAT (A1)
I002
A1=A-COVER METAL ASSY
(I002-I004)
LIGHT GUIDE (A2)
I005
DOME SHEET (A2)
I007
LED (A2)
I006
A2=UI BOARD ASSY
(I005-I010)
MICROPHONE
MEMBRANE (A3)
I014
MICROPHONE (A3)
I013
SUPPORT FOAM (A2)
I009
LCD CONNECTOR (A4)
I016
RETU TAHVO LID (A5)
I018
ENGINE MODULE (A5)
(NOT SUPPLIED)
I019
MICRO SD DOOR (A5)
I022
SYSTEM CONNECTOR (A8)
I032
CONNECTOR GASKET (A8)
I031
DC JACK (A8)
I033
A8=SYSTEM CONNECTOR
ASSEMBLY
(I031-I033)
C-COVER (A6)
I035
SIM COVER (A6)
I027
TYPE LABEL (A5)
I023
SCREWS T6+
I038
SCREWS T6+
I036
BATTERY COVER
I040
BATTERY COVER LOCKING
SCREW
I039
= These parts can not be reused after removal.
= only available as assembly
Ver. 0.1
ELECTRO
SILICON
METAL
PLASTIC
PWB
COVER

Figure 2 Exploded view of RM-86

Parts lists

Mechanical spare parts list

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

Ax and in bold = ASSY
"-" = NOT AVAILABLE
"XXXXXXX" = VARIANTS
"???????" = Code available in Bulletin
I0xx = ITEM codes for upper or mono block
I1xx = ITEM codes for hinge block
I2xx = ITEM codes for lower block
I3xx = ITEM codes for soldered spare parts on the upper, hinge or lower block and not exchangable

ITEM/ CIRCUIT REF.	QTY	PART NO	PART NAME	Note
I001	1	XXXXXXX	CO LABEL	Cannot be reused when removed.
A1	**1**	**XXXXXXX**	**A-COVER METAL ASSY(I002 - I004)**	
I002	1	-	KEYMAT	
I003	1	-	WINDOW	
I004	1	-	A-COVER METAL FRAME	
A2	**1**	**0211454**	**UI BOARD ASSY ASSY(I005 - I009)**	
I005	1	-	LIGHT GUIDE	
I006	1	-	LED	
I007	1	-	DOME SHEET	
I008		-	PWB RIGID 1ND	
I009	1	-	SUPPORT FOAM	
A3	**1**	**0268221**	**A-COVER ASSY(I010 - I014)**	
I010	1	-	A-COVER	
I011	1	9401224	SPEAKER GASKET	Cannot be reused when removed.
I012	1	5140251	SPEAKER	
I013	1	5149041	MICROPHONE	Cannot be reused when removed.
I014	1	-	MICROPHONE MEMBRANE	
A4	**1**	**4850935**	**LCD MODULE ASSY(I015 - I017)**	
I015	1	-	LCD MODULE	
I016	1	-	LCD CONNECTOR	
I017	1	-	COMPONENTS ON FLEX FOIL	

ITEM/ CIRCUIT REF.	QTY	PART NO	PART NAME	Note
A5	**1**	**-**	**1MZ ENGINE MODULE ASSY(I018 - I022)**	
I018	1	9590801	RETU TAHVO LID	Cannot be reused when removed.
I019	1	-	ENGINE MODULE	
I020	1	9590840	RF LID	Cannot be reused when removed.
I021	1	9590795	BB LID	Cannot be reused when removed.
I022	1	???????	MICRO SD DOOR	
I023	1	XXXXXXX	TYPE LABEL	Cannot be reused when removed.
A6	**1**	**0268426**	**C-COVER ASSY(I024 - I033)**	
I024	1	5149037	IHF SPEAKER DONAU	
I025	1	9401105	IHF MEMBRANE	Cannot be reused when removed.
I026	1	9590887	SIM COVER	
A7	**1**	**0269037**	**SIDE FLEX ASSY(I027 - I029)**	Cannot be reused when removed.
I027	1	-	FLEX FOIL	
I028	1	-	DOMES	
I029	1	-	FLASH LIGHT	
A8	**1**	**9469775**	**SYSTEM CONNECTOR ASSEMBLY (I030 - I032)**	Cannot be reused when removed.
I030	1	-	CONNECTOR GASKET	
I031	1	-	SYSTEM CONNECTOR	
I032	1	-	DC JACK	
I033	1	-	ANTENNA MODULE	
I034	4	6150091	SCREWS T6+	
I035	1	XXXXXXX	B-COVER ASSY	
I036	2	6380235	SCREWS T6+	
A9	**1**	**XXXXXXX**	**BATTERY-COVER ASSY(I037 - I038)**	
I037	1	-	BATTERY COVER LOCKING SCREW	
I038	1	-	BATTERY COVER	

RM-86 component parts list

Component parts list (1MZ_09c_asmmtx)

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS).

To ensure you are always using the latest codes, please check the PWS on a daily basis.

Item	Side	Grid		Description and value		
A2800	Bottom	K	4	SHIELD_040_012361	BASEBAND SHIELD ASSEMBLY	~
A7000	Bottom	E	4	SHIELD_040_013089	RF SHIELD ASSEMBLY	~
A7001	Top	P	4	SHIELD_040_012364	HR ASIC SHIELD ASSEMBLY	~
B2200	Top	R	6	CRYSTAL_3.3X1.6_H0.9	CRYSTAL 32.768KHZ +-30PPM 12.5PF	32.768kHz
C1471	Bottom	G	2	0402C	Chipcap 5% NP0	27p
C1472	Bottom	G	2	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C1473	Bottom	I	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C1474	Bottom	I	4	0402C	Chipcap 5% NP0	27p
C1475	Bottom	I	4	0402C	Chipcap X5R 10% 6.3V 0402	220n
C1476	Bottom	L	2	0805C	CHIPCAP X5R 10U M 6V3 0805	10U
C1479	Bottom	I	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C1480	Bottom	I	1	0402C	Chipcap X7R 10% 16V 0402	10n
C1481	Bottom	K	2	0603C	CHIPCAP X5R 10UF 6V3 0603	10u
C1482	Bottom	L	2	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C1483	Bottom	K	2	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C1484	Bottom	I	2	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C1485	Bottom	M	2	0402C	Chipcap X7R 10% 16V 0402	10n
C1486	Bottom	L	2	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C1487	Bottom	L	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C1488	Top	L	6	0402C	Chipcap 5% NP0	22p
C2000	Top	S	3	0402C	Chipcap 5% NP0	27p
C2002	Top	S	4	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C2003	Top	S	4	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C2004	Top	S	4	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C2005	Top	S	5	0402C	Chipcap X7R 10% 16V 0402	10n
C2006	Top	S	5	0402C	Chipcap X7R 10% 16V 0402	10n
C2007	Top	S	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2008	Top	S	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2009	Top	S	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2010	Top	S	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2011	Bottom	S	7	0402C	Chipcap 5% NP0	10p
C2012	Bottom	S	6	0402C	Chipcap 5% NP0	10p
C2013	Bottom	S	6	0402C	Chipcap 5% NP0	10p

Item	Side	Grid		Description and value		
C2014	Bottom	S	5	0402C	Chipcap 5% NP0	10p
C2015	Top	S	3	0603C_H0.95	CHIPCAP X5R 470N K 25V 0603	470n
C2018	Top	Q	2	0402C	CHIPCAP NP0 270P J 25V 0402	270p
C2071	Bottom	I	8	0402C	Chipcap 5% NP0	27p
C2072	Bottom	R	1	0402C	Chipcap 5% NP0	27p
C2100	Top	T	7	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C2101	Top	T	7	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C2102	Top	T	7	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C2103	Top	S	7	0402C	Chipcap X7R 10% 50V 0402	1n0
C2104	Top	S	7	0402C	Chipcap X7R 10% 50V 0402	1n0
C2200	Top	Q	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2201	Top	Q	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2202	Top	R	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C2203	Top	R	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2204	Top	R	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2205	Top	R	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C2206	Top	R	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2207	Top	R	7	0402C	Chipcap X7R 10% 50V 0402	1n0
C2208	Top	R	6	0402C	Chipcap 5% NP0	27p
C2209	Top	R	6	0402C	Chipcap 5% NP0	22p
C2210	Top	P	7	0603C	CHIPCAP X5R 1U K 16V 0603	1u0
C2211	Top	P	7	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7
C2212	Top	P	6	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2213	Top	Q	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2214	Top	Q	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2215	Top	P	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2216	Top	P	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2217	Top	R	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2219	Top	R	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2220	Top	P	6	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2221	Top	P	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2222	Top	P	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2223	Top	P	5	0402C	Chipcap X7R 10% 16V 0402	10n
C2224	Top	Q	5	0402C	Chipcap X7R 10% 16V 0402	10n
C2225	Top	Q	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0

Item	Side	Grid		Description and value		
C2226	Top	P	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2227	Top	P	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2228	Top	Q	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2230	Top	Q	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2231	Top	P	5	0805C	CHIPCAP X5R 10U M 6V3 0805	10U
C2232	Top	P	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2270	Top	Q	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C2271	Top	P	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C2272	Top	Q	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C2273	Top	P	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2274	Top	P	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2275	Top	P	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C2281	Top	Q	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2300	Top	N	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2301	Top	N	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2302	Top	O	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2303	Top	N	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2304	Top	O	6	0402C	Chipcap X7R 10% 16V 0402	10n
C2306	Top	M	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2307	Top	N	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2309	Top	N	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2312	Top	N	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2313	Top	N	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2314	Top	O	7	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C2315	Top	O	8	0805C_RKNM	CHIPCAP X5R 4U7 K 25V 0805	4u7
C2317	Top	N	8	0402C	Chipcap 5% NP0	47p
C2400	Top	M	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C2401	Top	M	4	0402C	Chipcap 5% NP0	27p
C2402	Top	M	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C2403	Top	M	4	0402C	Chipcap 5% NP0	27p
C2405	Top	C	7	0402C	Chipcap 5% NP0	68p
C2409	Bottom	C	7	0402C	Chipcap 5% NP0	56p
C2410	Bottom	B	7	0402C	Chipcap 5% NP0	56p
C2411	Bottom	B	7	0402C	Chipcap 5% NP0	56p
C2412	Bottom	B	7	0402C	Chipcap 5% NP0	56p

Item	Side	Grid		Description and value		
C2413	Bottom	C	7	0402C	Chipcap 5% NP0	56p
C2414	Bottom	C	7	0402C	Chipcap 5% NP0	56p
C2415	Bottom	C	7	0402C	Chipcap 5% NP0	56p
C2600	Bottom	P	8	0805C	CHIPCAP X5R 4U7 K 6V3 0805	4u7
C2601	Bottom	N	8	0402C	Chipcap 5% NP0	22p
C2602	Bottom	N	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C2603	Bottom	N	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C2700	Top	Q	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2800	Bottom	J	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2801	Bottom	K	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2802	Bottom	J	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2803	Bottom	M	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2804	Bottom	J	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2805	Bottom	J	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2807	Bottom	J	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2808	Bottom	K	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2809	Bottom	K	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2810	Bottom	J	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2811	Bottom	K	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2812	Bottom	M	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2813	Bottom	L	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2814	Bottom	J	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2815	Bottom	J	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2818	Bottom	L	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2820	Bottom	M	5	0402C	Chipcap 5% NP0	27p
C2824	Bottom	L	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C2830	Bottom	J	8	0402C	Chipcap X7R 10% 50V 0402	1n0
C3000	Bottom	M	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C3001	Bottom	M	5	0402C	Chipcap X7R 10% 16V 0402	10n
C3002	Bottom	M	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C3003	Bottom	M	5	0402C	Chipcap X7R 10% 16V 0402	10n
C3004	Bottom	M	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C3005	Bottom	K	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C3006	Bottom	M	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C3007	Bottom	K	3	0402C	Chipcap X7R 10% 16V 0402	10n

Item	Side	Grid		Description and value		
C3008	Bottom	M	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C3009	Bottom	M	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C3010	Bottom	M	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3011	Bottom	J	5	0402C	Chipcap +-0.25pF NP0	6p8
C3013	Bottom	K	5	0402C	Chipcap 5% NP0	27p
C3014	Bottom	K	5	0402C	Chipcap 5% NP0	68p
C3200	Bottom	M	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n
C3201	Bottom	M	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C3202	Bottom	M	3	0402C	Chipcap X7R 10% 16V 0402	10n
C3203	Bottom	M	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C3204	Bottom	M	3	0402C	Chipcap 5% NP0	27p
C3205	Bottom	M	3	0402C	Chipcap 5% NP0	27p
C6031	Top	N	1	0402C	Chipcap 5% NP0	18p
C6032	Top	P	2	0402C	Chipcap 5% NP0	100p
C6033	Top	P	2	0402C	Chipcap X7R 10% 16V 0402	10n
C6034	Top	O	2	0402C	Chipcap X7R 10% 16V 0402	10n
C6035	Top	P	1	0402C	Chipcap X7R 10% 16V 0402	10n
C6036	Top	P	2	0402C	Chipcap X7R 10% 16V 0402	10n
C6037	Top	P	2	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C6038	Top	O	1	0402C	Chipcap X7R 10% 16V 0402	10n
C6039	Top	O	2	0402C	Chipcap 5% NP0	18p
C6051	Top	O	2	0402C	Chipcap +-0.25pF NP0	2p7
C6052	Top	O	2	0402C	Chipcap +-0.25pF NP0	2p7
C6055	Top	N	1	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6157	Top	Q	4	0402C	Chipcap X7R 10% 16V 0402	10n
C6158	Top	P	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6159	Top	R	4	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C6162	Top	Q	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C6163	Top	Q	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C6164	Top	R	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6165	Top	R	4	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C6170	Top	Q	3	0402C	Chipcap X7R 10% 16V 0402	10n
C6176	Top	R	3	0402C	Chipcap 5% NP0	100p
C6178	Top	R	3	0402C	Chipcap 5% NP0	27p
C6179	Top	Q	3	0402C	Chipcap 5% NP0	47p

Item	Side	Grid		Description and value		
C6188	Top	R	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6189	Top	R	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6190	Top	R	5	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6191	Top	R	5	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6500	Top	O	4	0603C	CHIPCAP X5R 10UF 6V3 0603	10u
C6501	Top	O	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6502	Top	P	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C7501	Bottom	D	5	0402C	Chipcap +-0.25pF NP0	2p7
C7503	Bottom	F	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7504	Bottom	D	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C7505	Bottom	F	6	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C7506	Bottom	F	6	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C7507	Bottom	F	6	0402C	Chipcap X7R 10% 16V 0402	10n
C7508	Bottom	F	6	0402C	Chipcap 5% NP0	18p
C7509	Bottom	E	6	0402C	Chipcap X7R 10% 16V 0402	10n
C7510	Bottom	E	6	0402C	Chipcap 5% NP0	33p
C7511	Bottom	E	6	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2
C7513	Bottom	F	6	0402C	Chipcap X7R 10% 16V 0402	10n
C7515	Bottom	D	6	0402C	Chipcap +-0.25pF NP0	4p7
C7516	Bottom	D	6	0402C	CHIPCAP NP0 470P J 6V3 0402	470p
C7518	Bottom	F	5	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C7522	Bottom	F	3	0402C	Chipcap +-0.25pF NP0	1p8
C7523	Bottom	D	2	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C7524	Bottom	F	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C7525	Bottom	F	1	0402C	Chipcap 5% NP0	18p
C7526	Bottom	D	2	0402C	Chipcap +-0.25pF NP0	1p5
C7530	Bottom	E	6	0402C	CHIPCAP X7R 33N K 10V 0402	33n
C7590	Top	N	2	0402C	Chipcap X7R 10% 16V 0402	10n
C7591	Top	N	2	0402C	Chipcap 5% NP0	100p
C7597	Bottom	I	5	TANT_C_6.2X3.4_H1.7	CHIPTCAP 150U M 10V 6X3.2X1.5	150u_10V
D1470	Bottom	J	2	TFBGA84	HW ACCELERATOR STV0984N	~
D2200	Top	Q	6	TFBGA_108	RETU 3.02 TSA1GJWE TFBGA108	~
D2800	Bottom	K	6	uBGA_289	RAPGSM V1.1 PA uBGA289	~

Item	Side	Grid		Description and value		
D3000	Bottom	K	4	FBGA133_11.1X10.1_H1.3	T COMBO 256M+256M NOR +256M DDR DRAM	2x256 MNOR +256 MDDR
F2000	Top	S	2	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A
G2200	Top	L	2	BATTER_RB414H	RTC CAPACITOR 15UAH 2.6/3.3V 414-SIZE	3V3
G7500	Bottom	D	7	VCO_FDK_WB002	VCO 3296-3980MHZ 2.7V 20MA EGSM	3296-3980 MHz
G7501	Bottom	F	7	VCTCXO_KT21P2	VCTCXO 38.4MHZ 2.5V	38.4M Hz
L1401	Bottom	K	2	CHOKE_SER300	INDUCT WW 2.2UH 1A2 310 CASE SIZE	2u2H
L1472	Bottom	L	1	0603_BLM	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/ 100M Hz
L1473	Bottom	L	2	0603_BLM	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/ 100M Hz
L2000	Top	S	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100M Hz
L2001	Top	S	5	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100M Hz
L2002	Bottom	S	5	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100M Hz
L2003	Bottom	S	7	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100M Hz
L2004	Bottom	S	5	COIL_LK_1608	CHIP COIL 68NH J Q12/100MHZ 0603	68nH
L2100	Top	C	7	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100M Hz
L2102	Bottom	C	7	COIL_LQW1608	CHIP COIL 56N J Q38/200MHZ 0603	56nH
L2103	Bottom	C	7	COIL_LQW1608	CHIP COIL 56N J Q38/200MHZ 0603	56nH

Item	Side	Grid		Description and value		
L2202	Top	Q	8	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100M Hz
L2207	Top	R	5	0402L	FERR.BEAD 240R7100M 0.4A 0R4 0402	240R/100M Hz
L2208	Top	R	6	0402L	FERR.BEAD 240R7100M 0.4A 0R4 0402	240R/100M Hz
L2270	Top	P	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100M Hz
L2271	Top	Q	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100M Hz
L2272	Top	P	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100M Hz
L2273	Top	P	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100M Hz
L2301	Top	N	5	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100M Hz
L2302	Top	O	5	CHOKE_SER400_H1.2	INDUCT WW 10UH 0A65 0R35 4X4X1.2	10uH
L2304	Top	N	7	CHOKE_SER300_H1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH
L2305	Top	N	7	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100M Hz
L2306	Top	M	6	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100M Hz
L2400	Top	M	2	0402L	FERRITE BEAD 0.6R 33R/100MHZ 0402	33R/100M HZ
L2401	Top	C	7	0402L_H0.55	CHIP COIL 33N G Q20/500MHZ 0402	33nH
L2402	Top	M	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100M Hz
L2403	Top	M	4	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100M Hz

Item	Side	Grid		Description and value		
L2404	Top	B	8	0402L_H0.55	CHIP COIL 33N G Q20/500MHZ 0402	33nH
L2405	Top	C	7	0402L_H0.55	CHIP COIL 33N G Q20/500MHZ 0402	33nH
L3200	Bottom	M	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
L6030	Top	O	2	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H
L6031	Top	O	1	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H
L6032	Top	O	1	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L6156	Top	Q	4	COIL_0603CS	CHIP COIL 47N G Q38/200MHZ 0603	47nH
L6176	Top	R	3	COIL_LQW1608	CHIP COIL 120N J Q32/150MHZ 0603	120nH
L7500	Bottom	D	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7501	Bottom	D	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7502	Bottom	F	5	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
L7504	Bottom	E	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L7515	Bottom	D	6	0402L	CHIP COIL 15N J Q30/800M 0402	15nH
M2100	Bottom	G	6	VIBRA_M_KHN4NX1RA	SMD VIBRA MOTOR 1.3V 90MA 9000RPM	~
N1470	Bottom	K	2	USMD5_1.417X1.087	DC/DC CONV LM3671TLX-1.82V USMD5	~
N1471	Bottom	L	2	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-2.8 NOPB USMD5	~
N2300	Top	O	6	TFBGA_84_6.15X6.15	TAHVO V5.2 LF TFBGA84	~
N2301	Top	O	8	USMD8_1.69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~
N2600	Bottom	N	8	TFDU5307_TR3	IRDA TFDU5307-TR3 1.15MBIT/S 8.5X2.5X3MM	~
N3200	Bottom	M	2	USMD16_2.03X2.03	VREG & LEVEL SHIFT LP3928 USMD16	~
N6030	Top	O	2	CSP_47_3.85X4.05	BC4-ROM1.0RDL	~
N6156	Top	Q	4	WFBGA34_2_3.57X3.57	FM RECEIVER TEA5761UK N4B CSP (TI)	~
N6500	Top	P	4	QFN28_7.1X7.1	ACCELEROMETER 3-AXIS 2.4V QFN28	~
N7505	Bottom	E	5	TFBGA144	AHNE401A TRANCEIVER TFBGA144	~
N7520	Bottom	E	2	GSM_PA_V2_8.15	PW AMP PF89001 EGSM850/900/DCS/PCS CUT13	~
R1474	Bottom	I	2	0402R	Resistor 5% 63mW	4k7

Item	Side	Grid		Description and value		
R1475	Bottom	I	2	0402R	Resistor 5% 63mW	4k7
R1477	Top	L	6	0402R	Resistor 5% 63mW	47R
R2000	Top	S	5	0402R	Resistor 5% 63mW	220R
R2001	Top	S	5	uBGA11_2.15X1.65	ASIP MIC W/ESD RES+CAP+ZDI BGA11	~
R2002	Top	S	6	0402R	Resistor 5% 63mW	10R
R2003	Top	S	6	0402R	Resistor 5% 63mW	10R
R2004	Top	S	6	0402R	Resistor 5% 63mW	10R
R2005	Top	S	6	0402R	Resistor 5% 63mW	10R
R2006	Bottom	S	6	uBGA5	ASIP 4XESD **PB-FREE** BGA5	~
R2007	Top	Q	2	uBGA11_1.6X2.15	ASIP SILIC USB OTG / ESD BGA11	~
R2008	Top	Q	2	0404_RP	RES NETWORK 0W06 220K/120K J 0404	220k/ 120k
R2013	Top	Q	3	0402R	Resistor 5% 63mW	100R
R2070	Bottom	R	1	0402_NTH5	NTC RES 47K J B=4050+-3% 0402	47k
R2071	Bottom	I	8	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V
R2100	Top	T	7	FLIP_CHIP_8_1.7X1.7	ASIP SINGLE ENDED MICROPHONE INTERF BGA8	~
R2101	Top	T	7	0402R	Resistor 5% 63mW	220R
R2102	Top	S	7	0402R	Resistor 5% 63mW	10R
R2103	Top	S	7	0402R	Resistor 5% 63mW	10R
R2200	Top	R	8	0402R	Resistor 5% 63mW	100k
R2201	Top	R	7	0402R	Resistor 5% 63mW	120k
R2212	Top	Q	5	0402R	Resistor 5% 63mW	470R
R2213	Top	R	7	0402R	Resistor 5% 63mW	4k7
R2216	Top	R	7	0402R	CHIPRES 0W06 2M2 J 0402	2M2
R2301	Top	O	7	0402R	Resistor 5% 63mW	27R
R2305	Top	O	8	0402R	Resistor 5% 63mW	27R
R2307	Top	N	6	0402R	Resistor 5% 63mW	100R
R2308	Top	P	7	0402R	Resistor 5% 63mW	82R
R2309	Bottom	N	3	0402R	Resistor 5% 63mW	1k5
R2310	Bottom	M	3	0402R	Resistor 5% 63mW	1k5
R2311	Top	Q	4	0402R	Resistor 5% 63mW	3k3
R2312	Top	Q	4	0402R	Resistor 5% 63mW	3k3
R2400	Top	L	7	0402R	Resistor 5% 63mW	82R
R2401	Bottom	B	7	0402R	Resistor 5% 63mW	56R

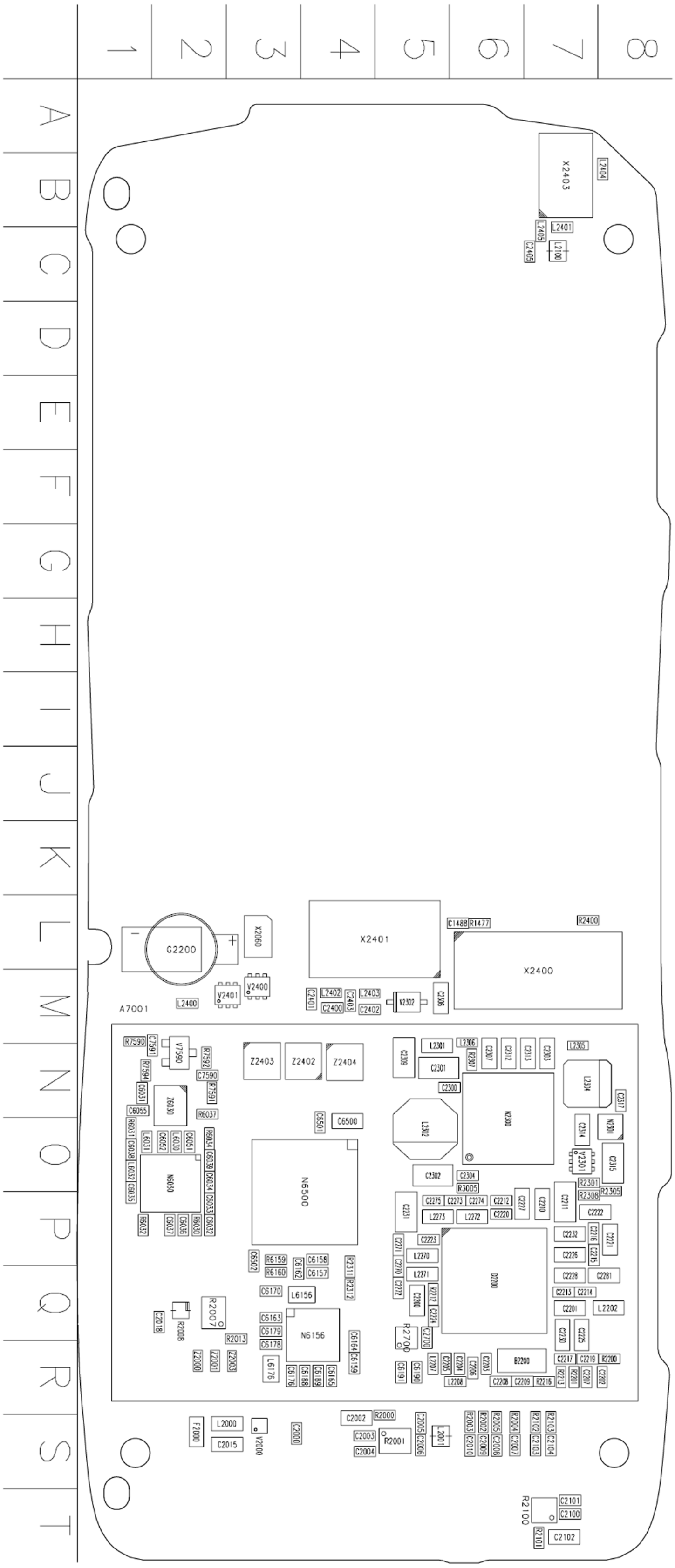
Item	Side	Grid		Description and value		
R2402	Bottom	B	7	0402R	Resistor 5% 63mW	56R
R2600	Bottom	Q	8	0805R_THERM1	CHIPRES 0W125 4R7 J 0805	4R7
R2700	Top	Q	5	uBGA8_1.47X1.47	ASIP SIM INTERFACE **LOW CAP**BGA8	~
R2803	Bottom	J	6	0402R	Resistor 5% 63mW	100R
R2804	Bottom	J	6	0402R	Resistor 5% 63mW	100R
R3002	Bottom	J	5	0402R	Resistor 5% 63mW	10R
R3003	Bottom	L	5	0402R	Resistor 5% 63mW	4k7
R3004	Bottom	J	5	0402R	Resistor 5% 63mW	4k7
R3005	Top	O	6	0402R	Chipres 0W06 jumper 0402	0R
R3013	Bottom	J	5	0402R	Resistor 5% 63mW	22R
R3200	Bottom	M	1	uBGA11_1.62X2.12	ASIP EMIF04-MMC02F2**PB-FREE**	~
R3201	Bottom	M	3	0402R	Resistor 5% 63mW	22k
R3202	Bottom	M	3	0402R	Resistor 5% 63mW	22k
R6030	Top	P	2	0402R	Resistor 5% 63mW	10k
R6031	Top	O	1	0402R	Resistor 5% 63mW	10k
R6032	Top	P	1	0402R	CHIPRES 0W06 2R2 J 0402	2R2
R6034	Top	O	2	0402R	Resistor 5% 63mW	10k
R6037	Top	N	2	0402R	Resistor 5% 63mW	100k
R6159	Top	P	3	0402R	Resistor 5% 63mW	10k
R6160	Top	Q	3	0402R	Resistor 5% 63mW	100k
R7501	Bottom	E	6	0402R	Resistor 5% 63mW	2k2
R7502	Bottom	D	5	0402R	CHIPRES 0W06 10K F 0402	10k
R7503	Bottom	F	5	0402R	Resistor 5% 63mW	4k7
R7505	Bottom	E	6	0402R	CHIPRES 0W06 8K2 F 0402	8k2
R7506	Bottom	E	6	0402R	Resistor 5% 63mW	18R
R7507	Bottom	D	5	0402R	Resistor 5% 63mW	10R
R7508	Bottom	E	6	0402R	Resistor 5% 63mW	10R
R7509	Bottom	F	6	0402R	Resistor 5% 63mW	22k
R7510	Bottom	F	2	0402R	Resistor 5% 63mW	15R
R7522	Bottom	F	2	0402R	CHIPRES 0W06 27K F 0402	27k
R7590	Top	M	1	0402R	Resistor 5% 63mW	2k2
R7591	Top	N	2	0402R	Resistor 5% 63mW	330R
R7592	Top	N	2	0402R	Resistor 5% 63mW	27k
R7594	Top	N	1	0402R	Resistor 5% 63mW	1k2

Item	Side	Grid		Description and value		
T7501	Bottom	E	7	TRANS_LDB213	TRANSF BALUN 3800+-550MHZ 0805	~
T7520	Bottom	D	2	TRANS_LDB15	TRANSF BALUN 1800+-100mhz 2x1.25	~
V2000	Top	S	3	BGA4_1.01X1.07	ASIP TVS BGA4	~
V2301	Top	O	7	SOT_666	TRX2 BIPOLAR 2XPNP 40V 0A1 0W12 SOT666	~
V2302	Top	M	5	SOD323F	SCH DI 30V 2A SOD323F	~
V2400	Top	M	3	SOT_666	TRX2+RX4 N 4K7/47K SOT666	~
V2401	Top	M	3	SOT_666	TRX2+RX4 N 4K7/47K SOT666	~
V7590	Top	N	2	SOT323	Tr NPN 12V 35mA SOT323	~
X1470	Bottom	H	4	SMIA85	SMIA85 SOCKET	~
X2060	Top	L	3	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~
X2070	Bottom	H	6	LYNX_BATT_CONN_H7.0	SM BATTERY CONN 3POL SPR 12V 2A	~
X2400	Top	M	7	SMK_4309_B_B_16P_V8	SM CONN 16P SPR P1.3 50V PWB/PWB	~
X2401	Top	L	4	MOLEX_54722BTOB	SM CONN 2X12 F P0.5 PWB/PWB	~
X2403	Top	B	7	MOLEX_51338_9974	CONN BTB REC F P0.4 5.5x3.3x1.34	~
X2700	Bottom	P	6	SIM_CONN_M_SK_200500165_H1.7	SM SIM CONN 6POL P2.54 H1.05	~
X3200	Bottom	P	3	SIM_CONN_SP04_13159_11	CONN MICRO SD HINGE	~
X7505	Bottom	C	2	RF_SWITCH_MS_156	SM CONN RF JACK 50R 2W 6GHZ	~
Z2000	Top	R	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2001	Top	R	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2003	Top	R	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2402	Top	N	4	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z2403	Top	N	3	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z2404	Top	N	4	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z2405	Bottom	B	7	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~
Z6030	Top	N	2	EZFVQ42NM61S	LTCC FILT 2441.75+-41.75MHZ 2.5X2	2441.75MHz

Item	Side	Grid		Description and value		
Z7501	Bottom	D	3	FILTER_2.1X1.7_10P_H0.6	SAW FILT 1842.5/1960MHZ 2.0X1.6MM	1842.5/1960MHZ
Z7503	Bottom	F	4	MODULE_SP_LMZ_137	TX SAW MODULE GSM 850/900MHZ	850/900MHz
Z7504	Bottom	E	3	FILTER_2.1X1.7_10P_H0.84	SAW FILT 850/900MHZ B9304 2.0X1.6X0.74	850/900MHz
Z7520	Bottom	D	3	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz

Component layouts

Component layout - top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G2200
X2060
X2401
C1488
R1477
R2400
X2400
A7001
L2400
V2401
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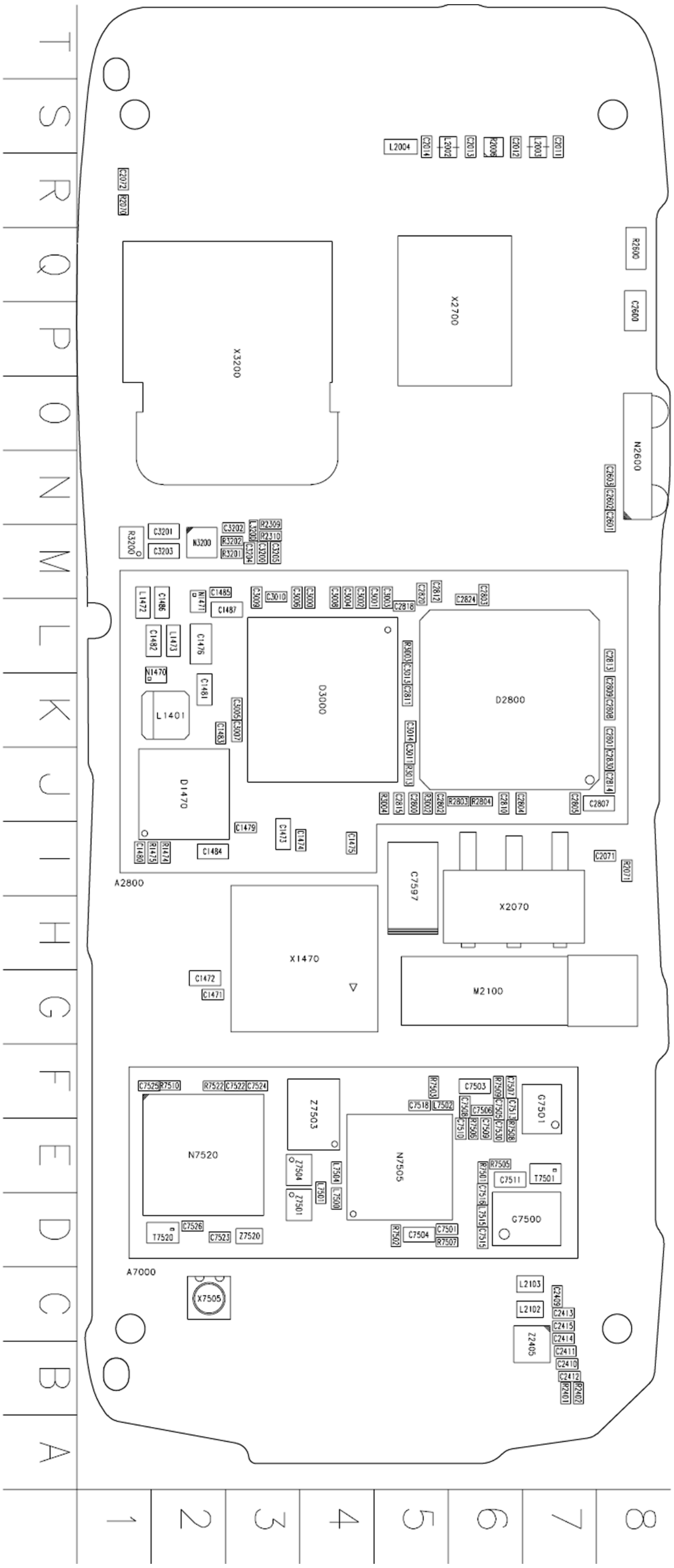
C2402
V2302
C2306
Z2403
Z2402
Z2404
C6500
N5500
N6030
L2301
C2301
C2300
L2306
L2305
N2300
N2301
L2302
L2304
C2302
C2304
R3005
L2273
L2272
N6156
L6156
D2200
L2202
R2007
R2013
R2008
Z2000
Z2001
Z2003
R2700
F7000
L2000
C2015
V2000
C2002
R2000
C2003
R2001
C2004
B2200
R2100
C2101
C2100
C2102

Component layout - bottom


T
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X3200
X2700
N2600
N3200
D3000
D2800
L1401
D1470
A2800
C7597
X2070
X1470
M2100
N7520
Z7503
N7505
G7501
G7500
T7520
T7501
Z7520
A7000
X7505
Z2405
L2004
L2102
L2103
R2600
C2600

3 — Service Software Instructions

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Phoenix installation steps in brief

Prerequisites

Recommended hardware requirements:

- Computer processor: Pentium 700 MHz or higher
- RAM 256 MB
- Disk space 100-300 MB

Supported operating systems:

- *Windows 2000* Service Pack 3 or higher
- *Windows XP* Service Pack 1 or higher

Context

Phoenix is a service software for reprogramming, testing and tuning phones.

Phoenix installation contains:

- Service software support for all phone models included in the package
- Flash update package files for programming devices
- All needed drivers for:
  - PKD-1 (DK2) dongle
  - DKU-2 or CA-53 USB cable

> **Note:** Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless there are updates between *Phoenix* service software releases. If separate update packages are used, they should be used after *Phoenix* and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- Product software binary files
- Files for type label printing
- Validation file for the faultlog repair data reporting system
- All product specific configuration files for *Phoenix* software components

> **Note:** *Phoenix* and phone data packages should only be used as complete installation packages. Uninstallation should be made from the *Windows* Control Panel.

To use *Phoenix*, you need to:

Steps

1. Connect a PKD-1 (DK2) dongle to the computer parallel port.
2. Install *Phoenix*.
3. Install the phone-specific data package.
4. Configure users.

5. Manage connection settings (depends on the tools you are using).

If you use FPS-10:	- Update FPS-10 software **Note:** There is no need to activate FPS-10. - Activate SX-4 smart card, if you need tuning and testing functions. **Note:** When FPS-10 is used only for product software updates, SX-4 smart card is not needed.

Results

Phoenix is ready to be used with FPS-10 flash prommer and other service tools.

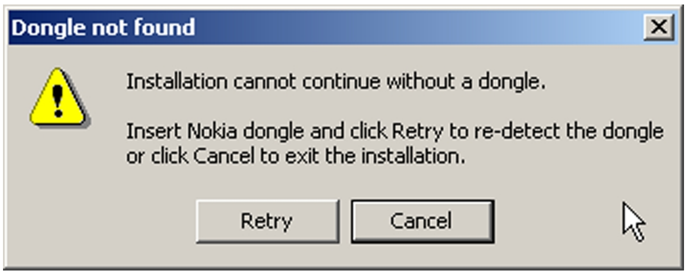
Installing *Phoenix*

Prerequisites

- Check that a dongle is attached to the parallel port of your computer.
- Download the *Phoenix* installation package (for example, *phoenix_service_sw_2004_39_x_xx.exe*) to your computer (in *C:|TEMP*, for instance).
- Close all other programs.
- Depending on your operating system, administrator rights may be required to install *Phoenix*.
- If uninstalling or rebooting is needed at any point, you will be prompted by the InstallShield program.

Context

At some point during the installation procedure, you may get the following message:



Installation cannot continue without a dongle.

Insert Nokia dongle and click Retry to re-detect the dongle or click Cancel to exit the installation.

Figure 3 Dongle not found

This may be a result of a defective or too old PKD-1 dongle.

Check the COM/parallel ports used. After correcting the problem, you can restart the installation.

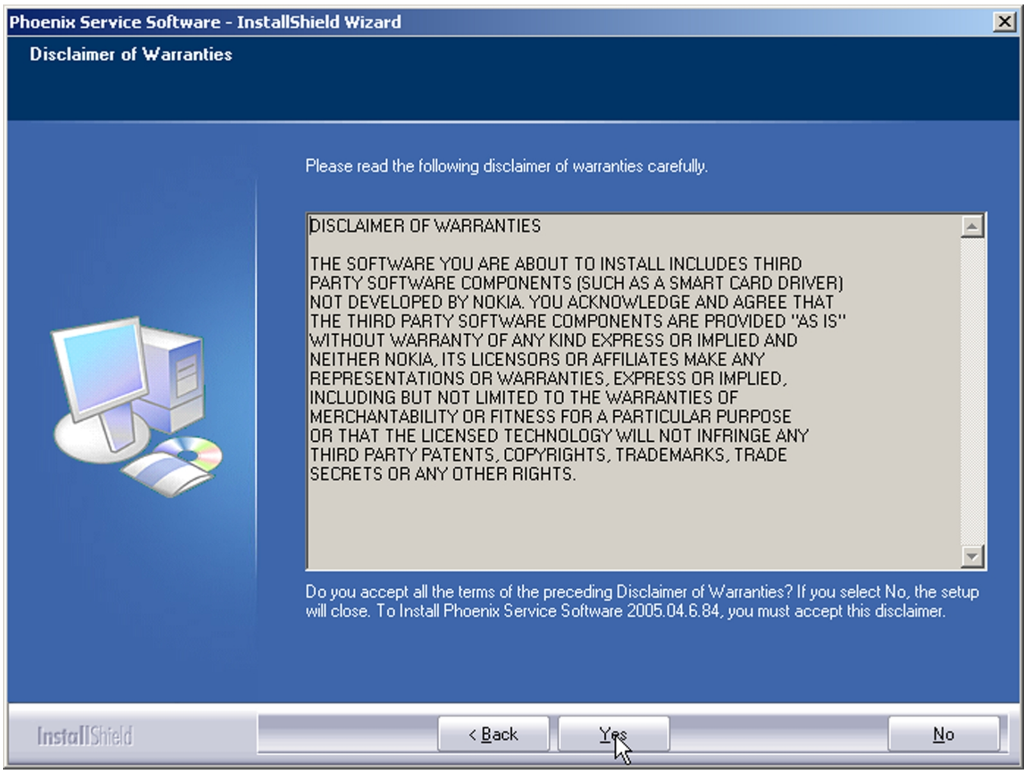
For more detailed information, please refer to *Phoenix* Help files.

> **Tip:** Each feature in *Phoenix* has its own Help function, which can be activated while running the program. Press the **F1** key or the feature's **Help** button to activate a Help file.

Steps

1. To start the installation, run the application file (for example,*phoenix_service_sw_2004_39_x_xx.exe*).
2. In the *Welcome* dialogue, click **Next**.

3. Read the disclaimer text carefully and click **Yes**.



Phoenix Service Software - InstallShield Wizard

Disclaimer of Warranties

Please read the following disclaimer of warranties carefully.

DISCLAIMER OF WARRANTIES

THE SOFTWARE YOU ARE ABOUT TO INSTALL INCLUDES THIRD PARTY SOFTWARE COMPONENTS (SUCH AS A SMART CARD DRIVER) NOT DEVELOPED BY NOKIA. YOU ACKNOWLEDGE AND AGREE THAT THE THIRD PARTY SOFTWARE COMPONENTS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND EXPRESS OR IMPLIED AND NEITHER NOKIA, ITS LICENSORS OR AFFILIATES MAKE ANY REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR THAT THE LICENSED TECHNOLOGY WILL NOT INFRINGE ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADEMARKS, TRADE SECRETS OR ANY OTHER RIGHTS.

Do you accept all the terms of the preceding Disclaimer of Warranties? If you select No, the setup will close. To Install Phoenix Service Software 2005.04.6.84, you must accept this disclaimer.

Figure 4 Disclaimer text

4. Choose the destination folder.

   The default folder *C:|ProgramFiles|Nokia|Phoenix* is recommended.
5. To continue, click **Next.**

   To choose another location, click **Browse** (not recommended).
6. Wait for the components to be copied.

   The progress of the installation is shown in the *Setup Status* window.
7. Wait for the drivers to be installed and updated.

   The process may take several minutes to complete.

   If the operating system does not require rebooting, the PC components are registered right away.

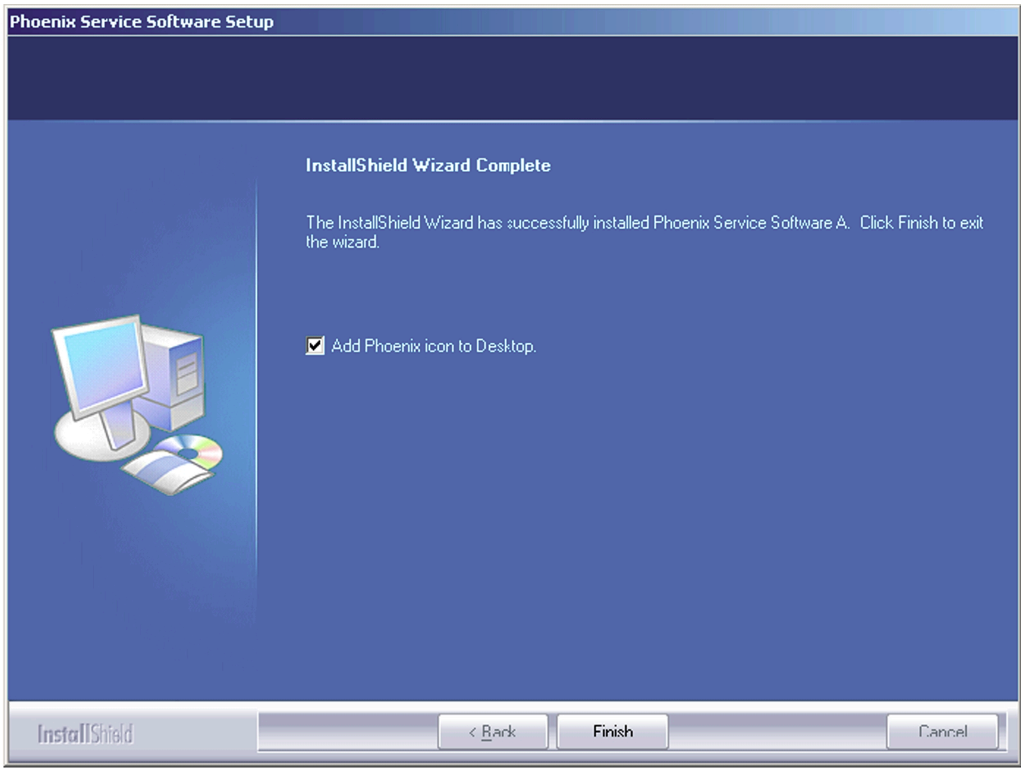
   If the operating system requires restarting your computer, the Install Shield Wizard will notifies about it.

   Select **Yes...** to reboot the PC immediately or **No...** to reboot the PC manually afterwards.

   After the reboot, all components are registered.

   > **Note:** *Phoenix* does not work, if the components have not been registered.

8. To end the installation, click **Finish**.



InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Phoenix Service Software A. Click Finish to exit the wizard.

☑ Add Phoenix icon to Desktop.

Figure 5 InstallShield Wizard Complete

Next actions

After the installation, *Phoenix* can be used after:

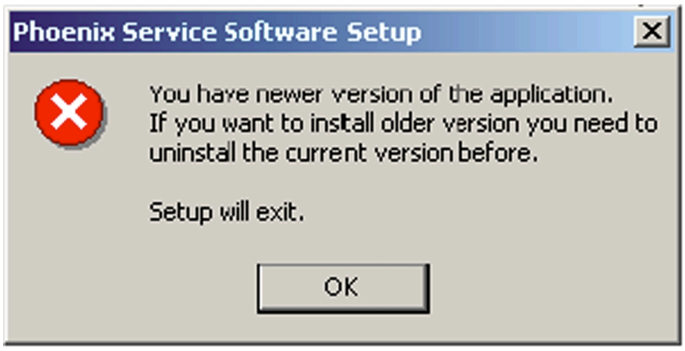
- installing phone model specific data package for *Phoenix*
- configuring users and connections

FPS-10 flash prommer can be used after updating their flash update package files.

Updating *Phoenix* installation

Context

- If you already have the *Phoenix* service software installed on your computer, you need to update the software when new versions are released.
- To update *Phoenix*, you need to follow the same steps as when installing it for the first time.
- When you are updating, for example, from version **a14_2004_16_4_47** to **a15_2004_24_7_55**, the update will take place automatically without uninstallation.
- Always use the latest available versions of both *Phoenix* and the phone-specific data package. Instructions can be found in the phone model specific Technical Bulletins and phone data package *readme.txt* files (shown during installation).
- If you try to update *Phoenix* with the same version you already have (for example, **a15_2004_24_7_55** to **a15_2004_24_7_55**), you are asked if you want to uninstall the existing version. In this case you can choose between a total uninstallation or a repair installation in a similar way when choosing to uninstall the application from the *Windows* Control Panel.
- If you try to install an older version (for example, downgrade from **a15_2004_24_7_55** to **a14_2004_16_4_47**), installation will be interrupted.



You have newer version of the application.
If you want to install older version you need to uninstall the current version before.

Setup will exit.

Figure 6 Installation interrupted

- Always follow the instructions on the screen.

Steps

1. Download the installation package to your computer hard disk.
2. Close all other programs.
3. Run the application file (for example, *phoenix_service_sw_2004_39_x_xx.exe*).

Results

A new *Phoenix* version is installed and driver versions are checked and updated.

Uninstalling *Phoenix*

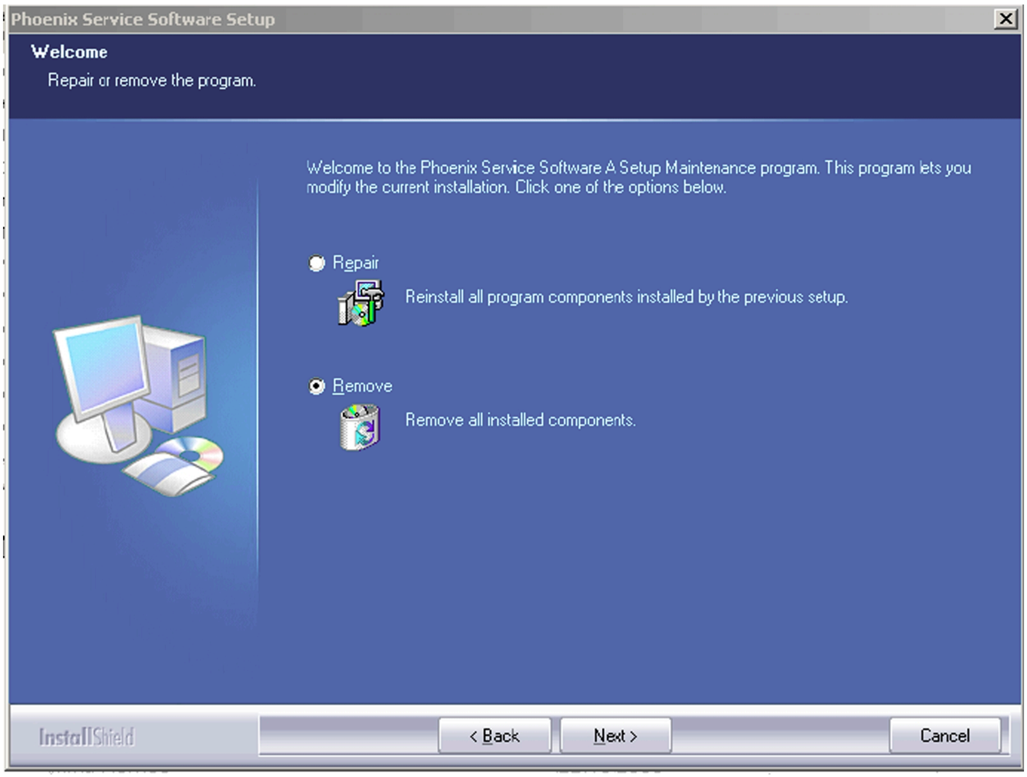
Context

You can uninstall *Phoenix* service software manually from the *Windows* Control Panel.

Steps

1. Open the **Windows Control Panel**, and choose **Add/Remove Programs**.

2. To uninstall *Phoenix*, choose **Phoenix Service Software→Change/Remove→Remove** .


Phoenix Service Software Setup
Welcome
Repair or remove the program.
Repair
Remove
InstallShield
< Back
Next >
Cancel

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

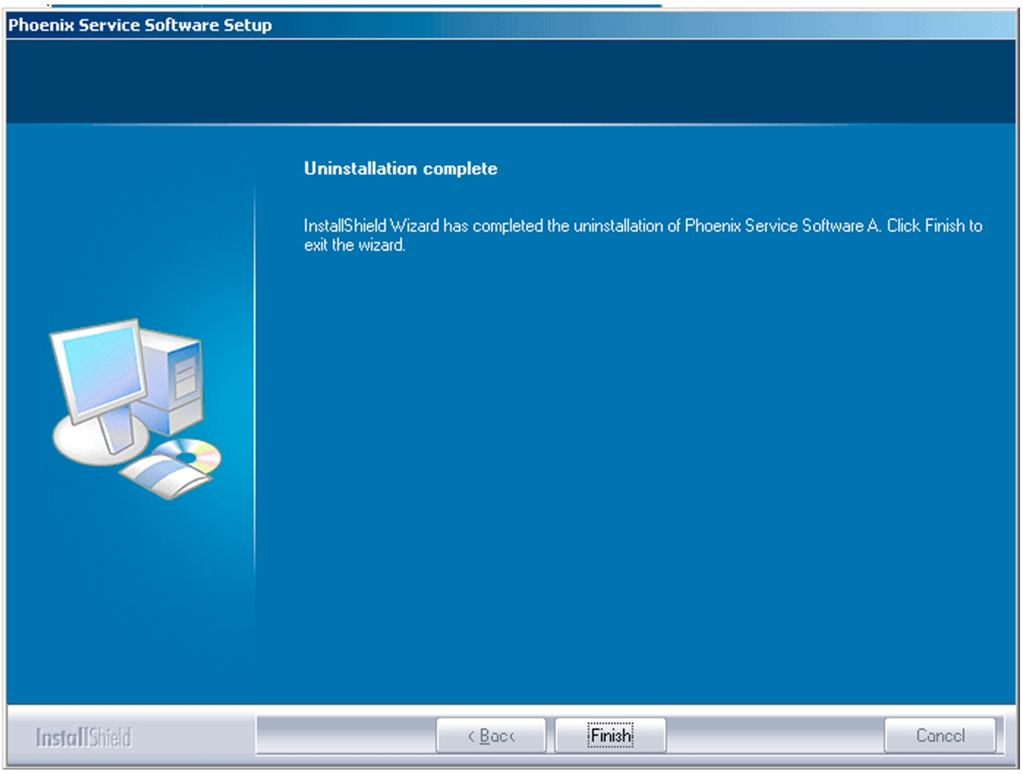
○ Repair
Reinstall all program components installed by the previous setup.

● Remove
Remove all installed components.

Figure 7 Remove program

The progress of the uninstallation is shown.

3. If the operating system does not require rebooting, click **Finish** to complete.


Phoenix Service Software Setup
InstallShield
< Back
Finish
Cancel

Uninstallation complete

InstallShield Wizard has completed the uninstallation of Phoenix Service Software A. Click Finish to exit the wizard.

Figure 8 Finish uninstallation

If the operating system requires rebooting, InstallShield Wizard will notify you. Select **Yes...** to reboot the PC immediately and **No...** to reboot the PC manually afterwards.

Repairing *Phoenix* installation

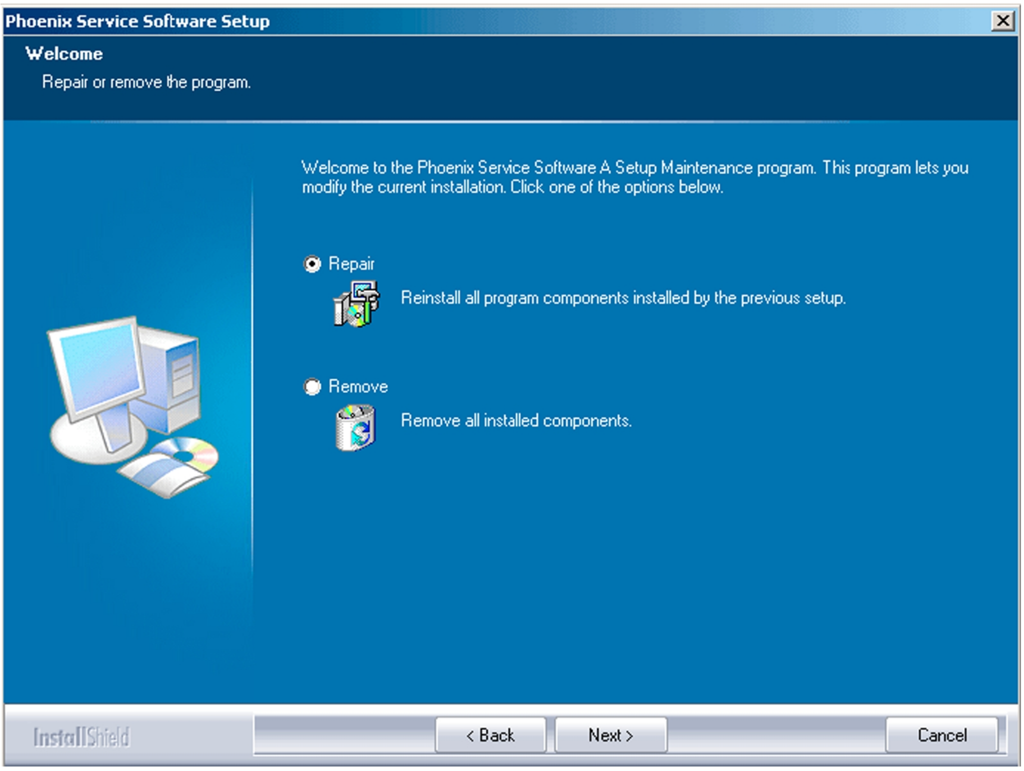
Context

If you experience any problems with the service software or suspect that files have been lost, use the repair function before completely reinstalling *Phoenix*.

> **Note:** The original installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) must be found on your PC when you run the repair setup.

Steps

1. Open **Windows Control Panel→Add/Remove Programs** .
2. Choose **Phoenix Service Software→Change/Remove** .
3. In the following view, select **Repair**.



Phoenix Service Software Setup

Welcome

Repair or remove the program.

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

● Repair

Reinstall all program components installed by the previous setup.

○ Remove

Remove all installed components.

Figure 9 Repair program

Phoenix reinstalls components and registers them.

The procedure is the same as when updating *Phoenix*.

4. To complete the repair, click **Finish**.

Installing phone data package

Prerequisites

- A phone-specific data package contains all data required for the *Phoenix* service software and service tools to be used with a certain phone model.
- Check that a dongle is attached to the parallel port of your computer.

- Install *Phoenix* service software.
- Download the installation package (for example, *XX-XX_dp_EA_v_1_0.exe*) to your computer (for example, in C:\TEMP).
- Close all other programs.

(XX-XX = type designator of the product)

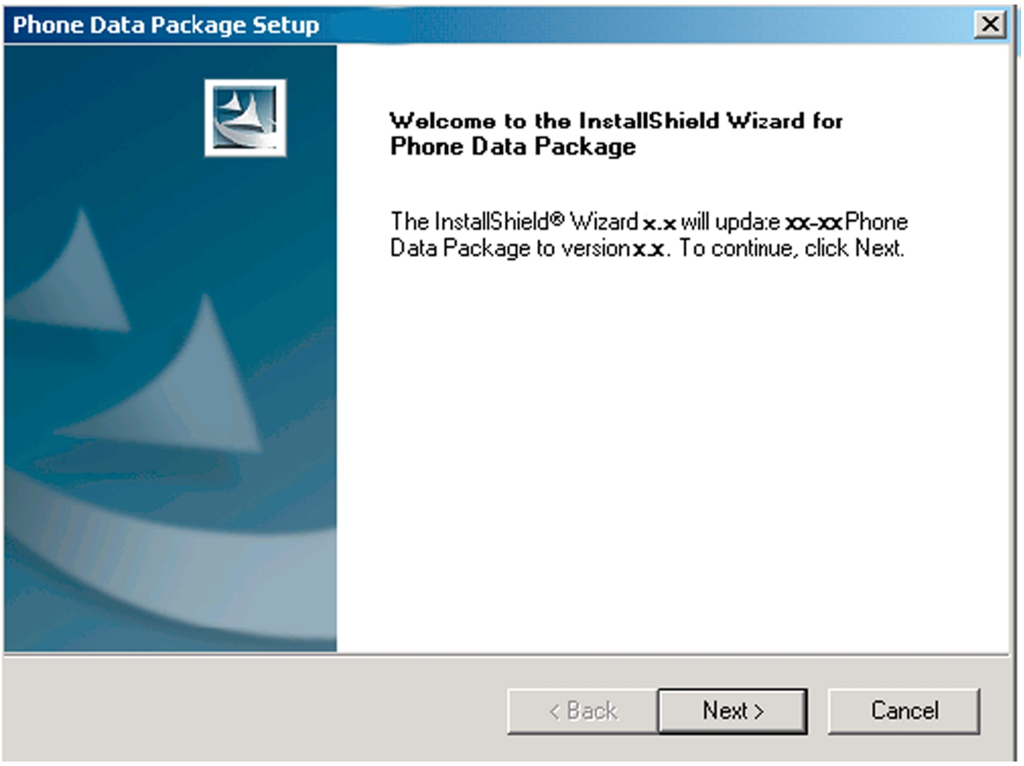
If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

> **Note:** Often *Phoenix* and the phone-specific data package come in pairs, meaning that a certain version of *Phoenix* can only be used with a certain version of a data package. Always use the latest available versions of both. Instructions can be found in phone-specific Technical Bulletins and *readme.txt* files of data packages.

Steps

1. To start the installation, run the application file (for example, *XX-XX_dp_EA_ v_1_0.exe*),

   Wait for the installation files to be extracted.
2. Click **Next**.

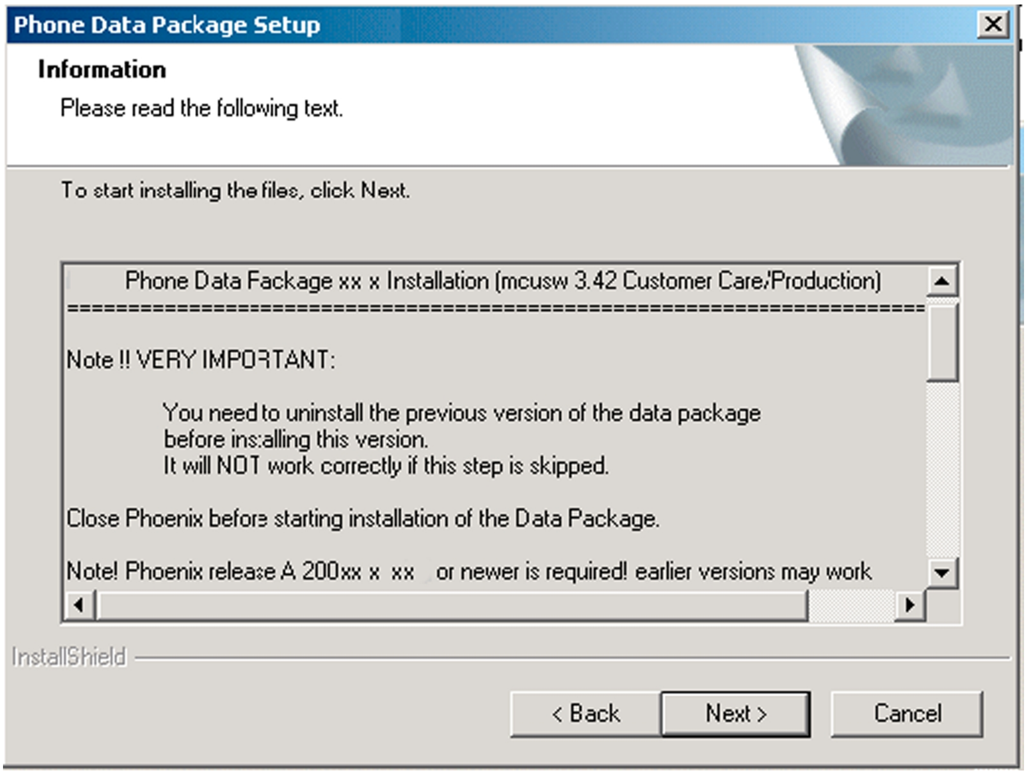


Phone Data Package Setup

Welcome to the InstallShield Wizard for Phone Data Package

The InstallShield® Wizard **x.x** will update **xx-xx** Phone Data Package to version **x.x**. To continue, click Next.

3. In the following view you can see the contents of the data package. Read the text carefully. There is information about the *Phoenix* version required with this data package.



Information

Please read the following text.

To start installing the files, click Next.

Phone Data Package xx x Installation (mcusw 3.42 Customer Care/Production)
===

Note !! VERY IMPORTANT:

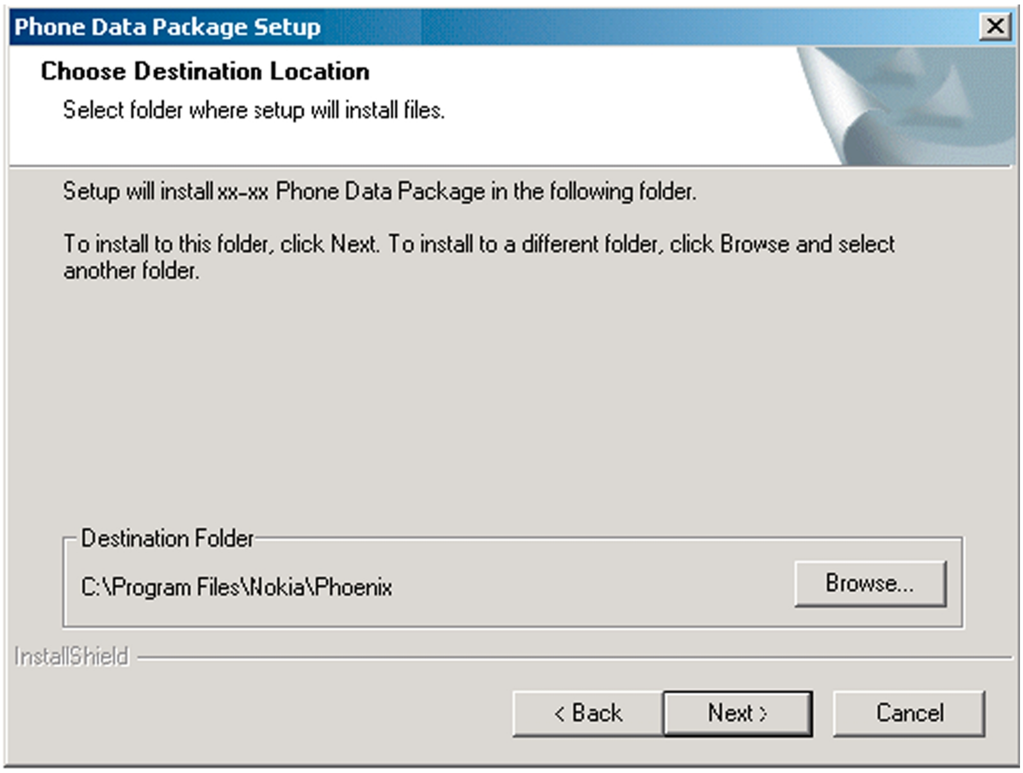
You need to uninstall the previous version of the data package
before installing this version.
It will NOT work correctly if this step is skipped.

Close Phoenix before starting installation of the Data Package.

Note! Phoenix release A 200xx x xx or newer is required! earlier versions may work

Figure 10 Data package setup information

4. To continue, click **Next**.
5. Choose the destination folder, and click **Next** to continue.



Choose Destination Location

Select folder where setup will install files.

Setup will install xx-xx Phone Data Package in the following folder.

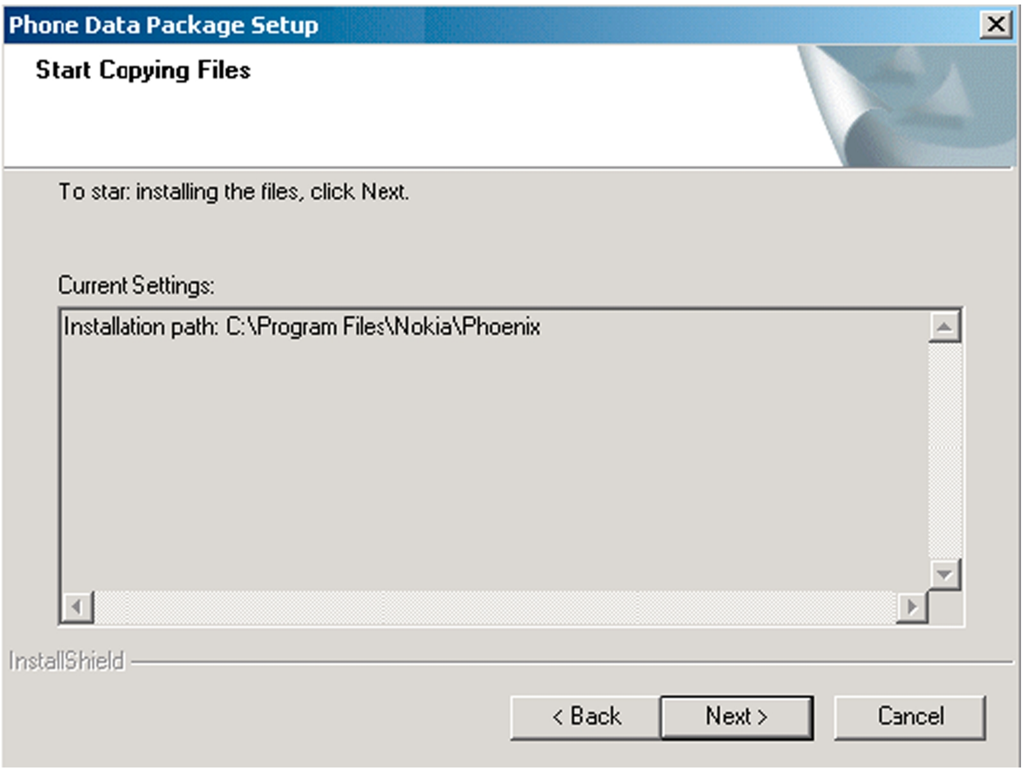
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder
C:\Program Files\Nokia\Phoenix

Figure 11 Data package destination folder

The InstallShield Wizard checks where *Phoenix* is installed, and the directory is shown.

6. To start copying the files, click **Next**.


Phone Data Package Setup
Start Copying Files
InstallShield
< Back
Next >
Cancel

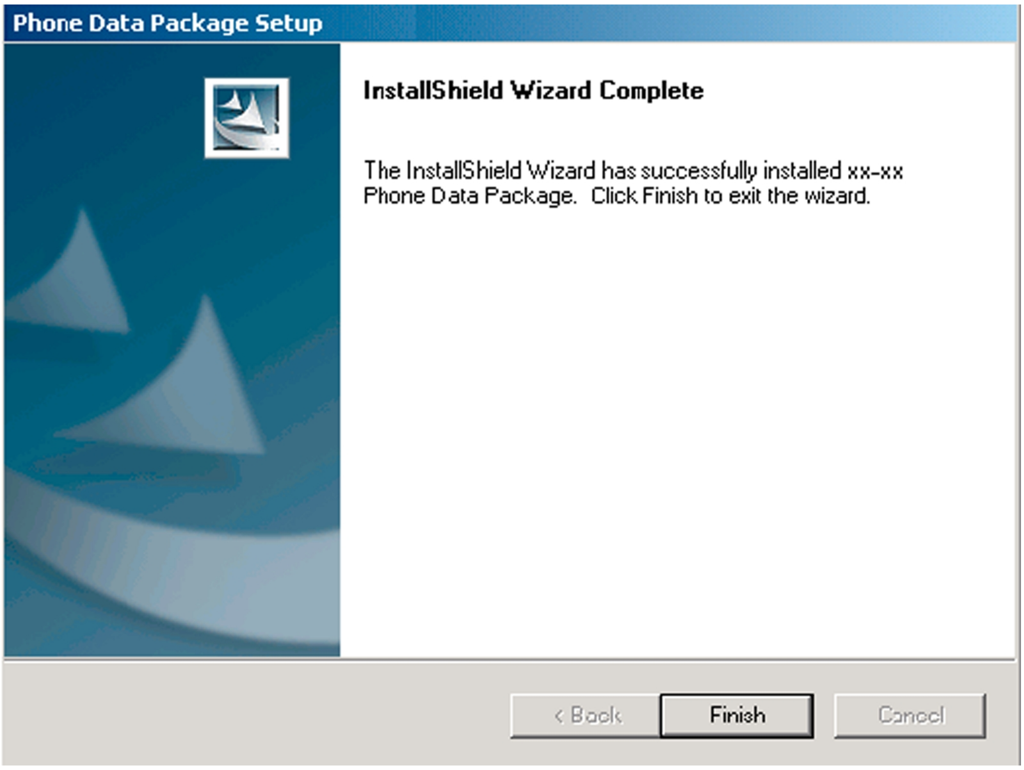
To star: installing the files, click Next.

Current Settings:

Installation path: C:\Program Files\Nokia\Phoenix

Phone model specific files are installed. Please wait.

7. To complete the installation, click **Finish**.


Phone Data Package Setup
< Back
Finish
Cancel

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 12 InstallShield Wizard Complete

Next actions

Phoenix can be used for flashing phones and printing type labels after:

- Configuring users
- Managing connections

FPS-10 can be used after updating its flash update package files.

Uninstalling phone data package

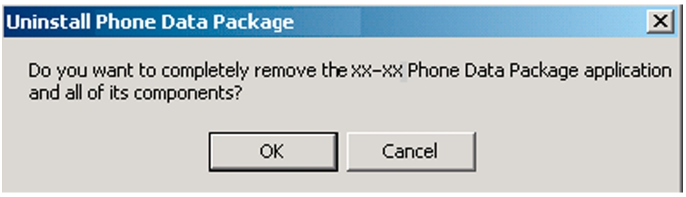
Context

There is no need to uninstall an older version of a data package, unless instructions to do so are given in the *readme.txt* file of the data package and bulletins related to the release.

Please read all related documents carefully.

Steps

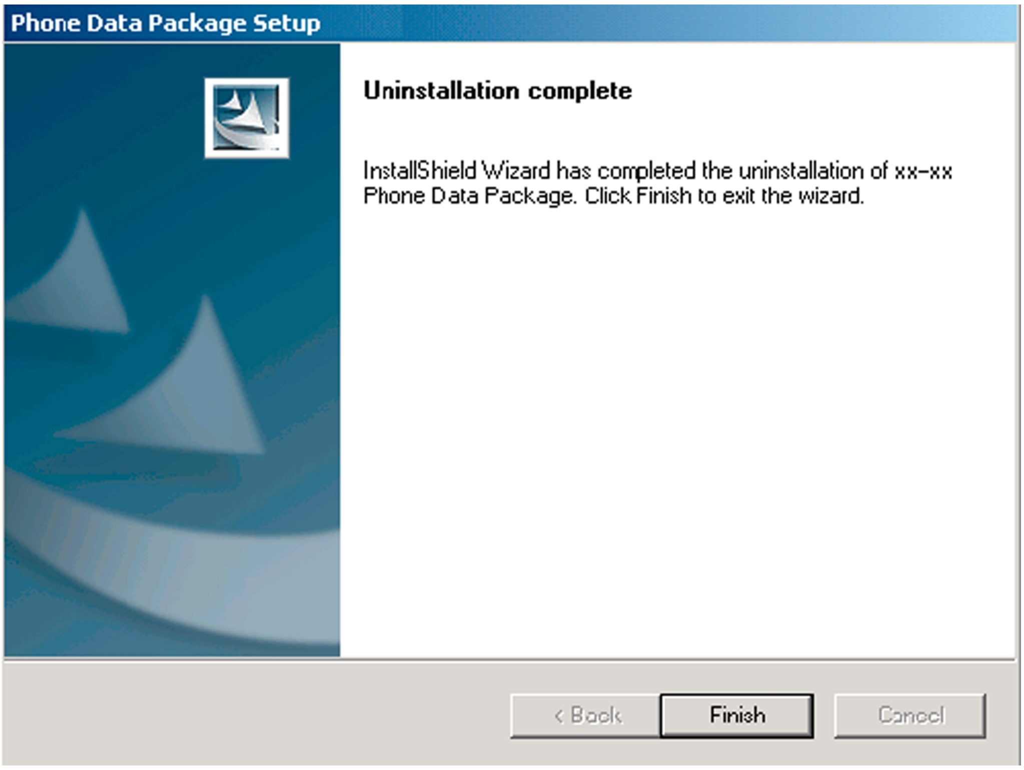
1. Locate the data package installation file (e.g. *XX-XX_dp_EA_v_1_0.exe*) from your computer.
2. To start the uninstallation procedure, double-click the data package installation file.
3. To uninstall the data package, click **OK** or to interrupt the uninstallation, click **Cancel**.



Do you want to completely remove the XX-XX Phone Data Package application and all of its components?

Figure 13 Uninstalling phone data package

4. When the data package is uninstalled, click **Finish**.



Phone Data Package Setup

Uninstallation complete

InstallShield Wizard has completed the uninstallation of xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 14 Finishing data package uninstallation

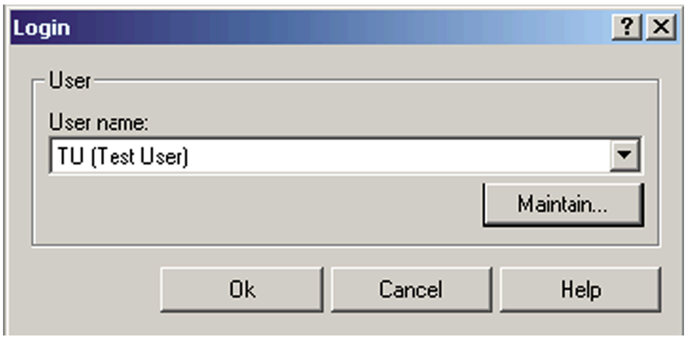
Alternative steps

- You can also uninstall the data package manually from **Control Panel→Add/Remove Programs→xx-xx* Phone Data Package** . (*= type designator of the phone).

Configuring users in *Phoenix*

Steps

1. Start *Phoenix* service software, and log in.



User name: TU (Test User)

Figure 15 Phoenix login

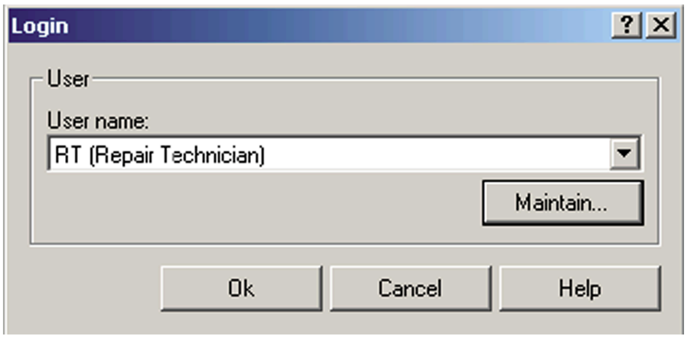
If the user ID is already configured, select s/he from the *User name* drop-down list, and click **OK**.

2. To add a new user, or to edit existing ones, click **Maintain**.
3. To add a new user, click **New**.

4. Type in the name and initials of the user, and click **OK**.

   The user is added to the user name list.

5. Select the desired user from the *User name* drop-down list, and click **OK**.



User name: RT (Repair Technician)

Figure 16 New user configured

Managing connections in *Phoenix*

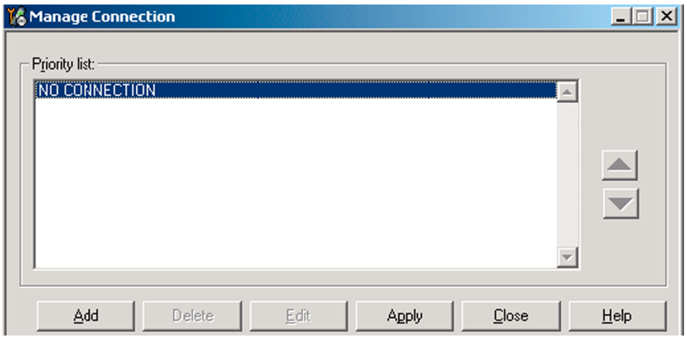
Context

With the **Manage Connections** feature you can edit and delete existing connections or create new ones.

> **Note:** After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.
>
> If there are problems after the driver installation, check that the USB connection is active from the **Windows Control Panel**. If the problem persists, contact the local PC support.

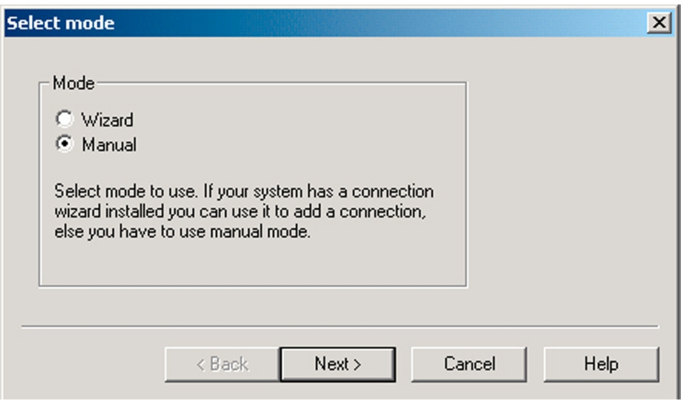
Steps

1. Start *Phoenix*, and log in.
2. Choose **File→Manage Connections...** .
3. To add a new connection, click **Add**.



4. Select **Manual** mode, and click **Next** to continue.

   If you want to create the connection using the Connection Wizard, connect the tools and a phone to your PC. The wizard will automatically try to configure the correct connection.



Select mode

Mode

○ Wizard
● Manual

Select mode to use. If your system has a connection wizard installed you can use it to add a connection, else you have to use manual mode.

Figure 17 Select mode: Manual

i For an FPS-10 flash prommer with a **USB Connection**, choose the following connection settings:

- Media: **FPS-10 USB**
- DEVICE_INDEX: **0**
- SERIAL_NUM: See Serial No from the label attached to the bottom of FPS-10
- ACTIVE_MEDIA: **USB**

ii For an FPS-10 flash prommer with a **LAN connection**, choose the following connection settings:

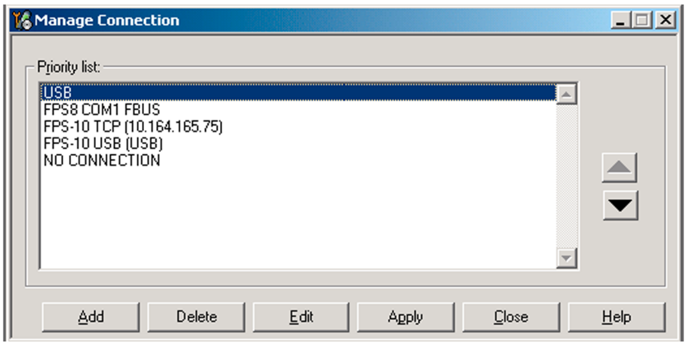
- Media: **FPS-10 TCP/IP**
- NET_SERV_NAME: Click **Scan...**. Choose your own FPS-10 device based on the correct MAC address. See Serial No from the label attached to the bottom of your FPS-10.
- PORT_NUM: Use the default value, and click **Next**.
- PROTOCOL_FAMILY: Use the default value, and click **Next**.
- SOCKET TYPE: Use the default value, and click **Next**.
- TX_BUFFER_SIZE: Use the default value, and click **Next**.
- RX_BUFFER_SIZE: Use the default value, and click **Next**.

iii For a plain **USB connection**, choose the following connection settings:

Note: First connect the DKU-2 or CA-53 USB cable between the PC USB port and phone.

- Media: USB

5. To complete the configuration, click **Finish**.
6. Click the connection you want to activate. Use the up/down arrows located on the right hand side to move it on top of the list, then click **Apply**.



Manage Connection

Priority list:

USB
FPS8 COM1 FBUS
FPS-10 TCP (10.164.165.75)
FPS-10 USB (USB)
NO CONNECTION

Figure 18 Connections list

The connection is activated, and it can be used after closing the *Manage Connection* window.

The connection information is shown at the right hand bottom corner of the screen.

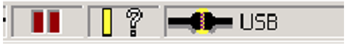
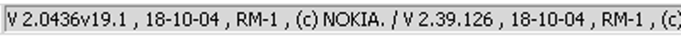


Figure 19 Connection information

7. To use the connection, connect the phone to your PC with correct service tools. Make sure the phone is switched on, and then choose **File→Scan Product** .

Results

The product support module information appears in the status bar:



V 2.0436v19.1 , 18-10-04 , RM-1 , (c) NOKIA. / V 2.39.126 , 18-10-04 , RM-1 , (c)

Figure 20 Product support module information (example from RM-1)

Installing flash support files for FPS-10

Prerequisites

- Install *Phoenix* service software.
- Install phone model specific data package for *Phoenix*.
- If you want to update the flash support files, they are delivered in the same installation package with *Phoenix* or newer *Phoenix* packages beginning from December 2004.

  In case you want to update the MCU files, install the latest data package (see Technical Bulletins for information on the latest one).

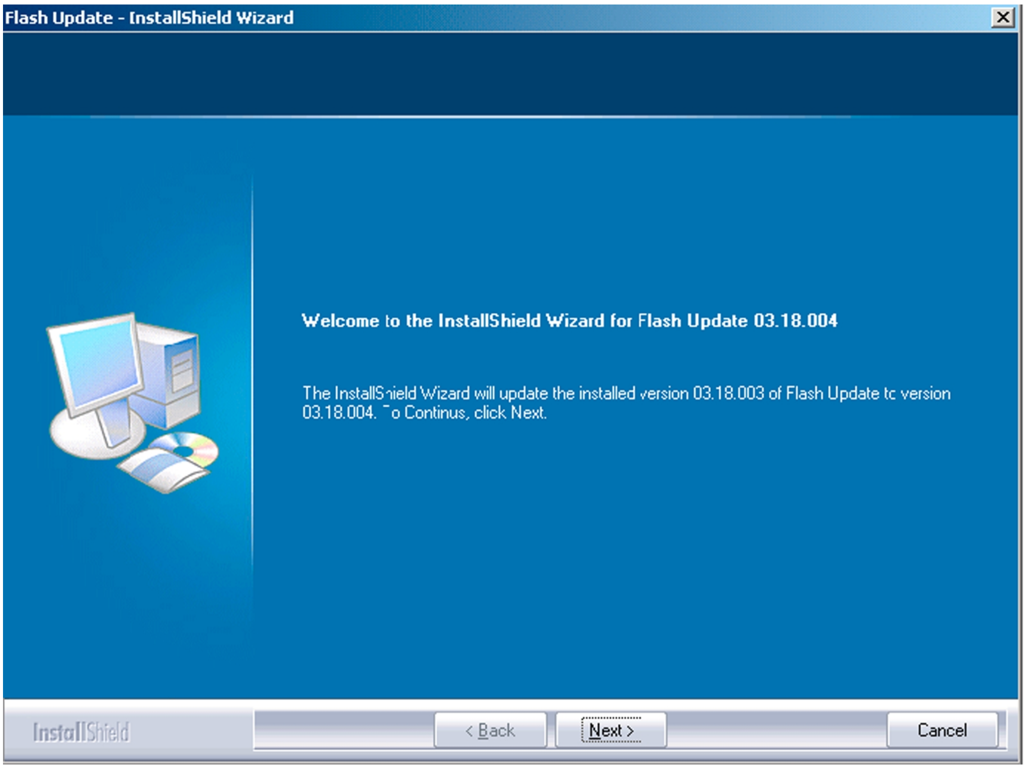
  Normally, it is enough to install *Phoenix* and the phone-specific data package because the installation always includes the latest flash update package files for FPS-10.
- A separate installation package for flash support files is available. The files can be updated according to these instructions, if updates appear between *Phoenix* data package releases.

Context

If you are not using a separate installation package, you can skip this section and continue with "Updating FPS-10 flash prommer software" (page 3–22) after installing a new phone data package.

Steps

1. To begin the installation, double-click the flash update file (for example, *flash_update_03_183_0014.exe*).



Welcome to the InstallShield Wizard for Flash Update 03.18.004

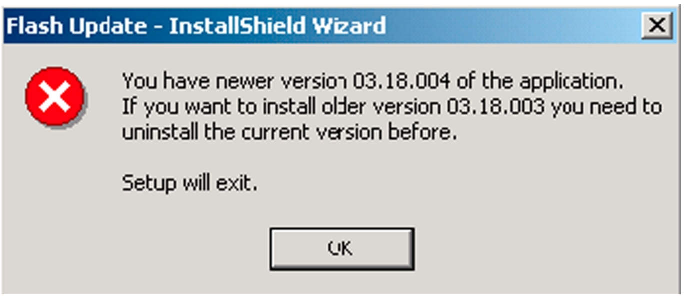
The InstallShield Wizard will update the installed version 03.18.003 of Flash Update to version 03.18.004. To Continue, click Next.

Figure 21 Flash update welcome dialog

   If the same version of the flash update package already exists, and you want to reinstall it, the previous package is first uninstalled.

   Restart installation again after the uninstallation.

2. If you try to downgrade the existing version to older ones, the setup will be aborted. If there is a need to downgrade the version, uninstall newer files manually from the **Windows Control Panel**, and then rerun the installation.



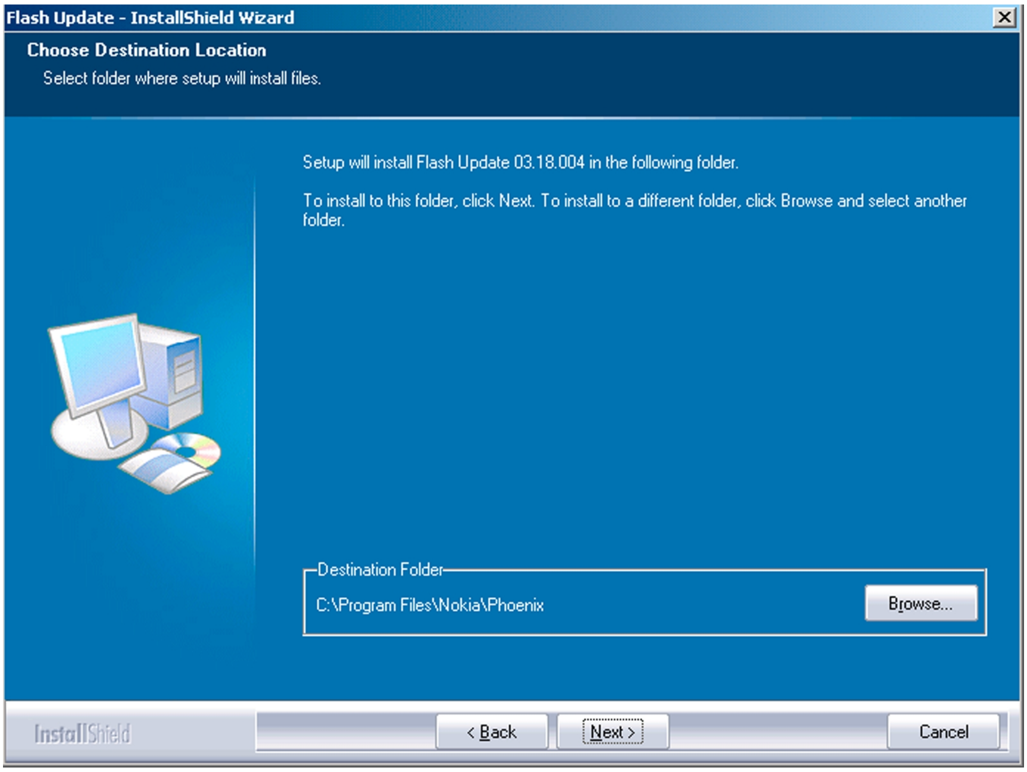
You have newer version 03.18.004 of the application.
If you want to install older version 03.18.003 you need to uninstall the current version before.

Setup will exit.

Figure 22 Flash installation interrupted

   If an older version exists on your PC and it needs to be updated, click **Next** to continue installation.

3. It is recommended to install the files to the default destination folder *C:|Program Files|Nokia|Phoenix*. To continue, click **Next**.


Flash Update - InstallShield Wizard
Choose Destination Location
Select folder where setup will install files.
Destination Folder
Browse...
InstallShield
< Back
Next >
Cancel

Setup will install Flash Update 03.18.004 in the following folder.

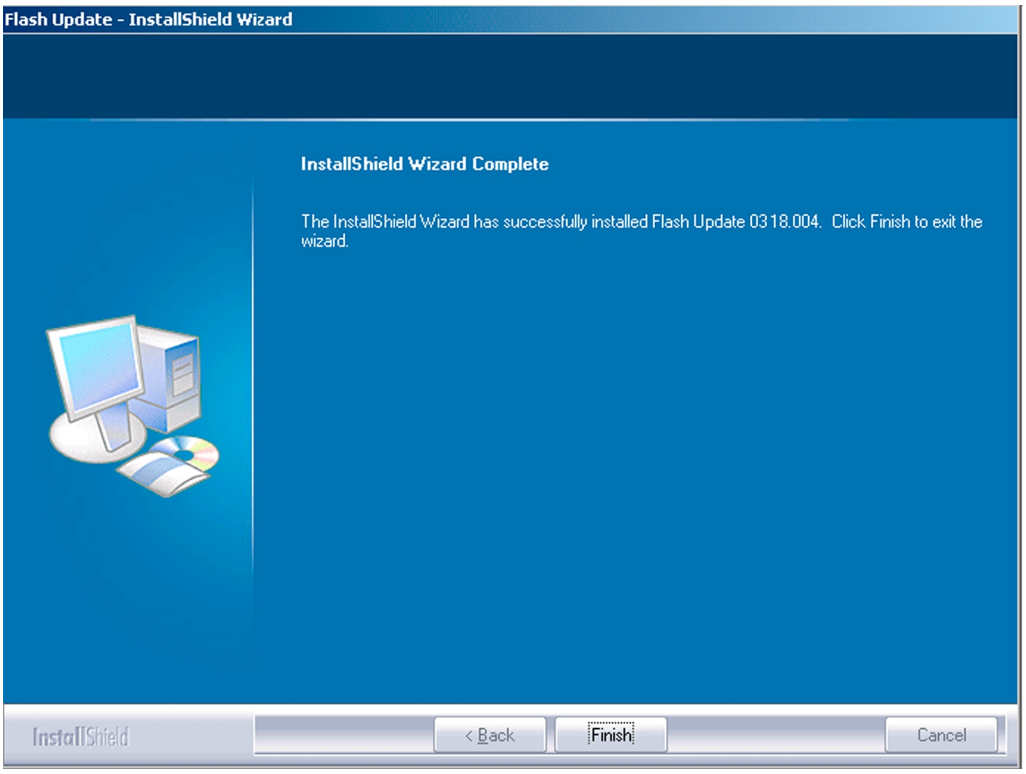
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

C:\Program Files\Nokia\Phoenix

Figure 23 Flash destination folder

When installing the flash update files for the first time, you may choose another location by selecting **Browse** (not recommended).

4. To complete the installation procedure, click **Finish** .



Flash Update - InstallShield Wizard
InstallShield
< Back
Finish
Cancel

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Flash Update 0318.004. Click Finish to exit the wizard.

Figure 24 Finish flash update

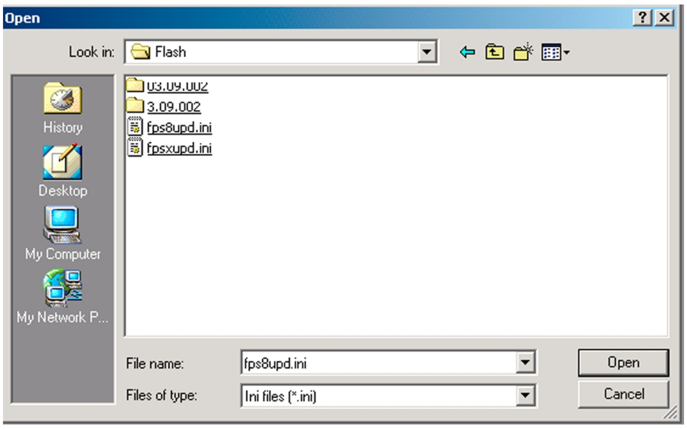
Next actions

FPS-10 flash prommer must be updated using *Phoenix*.

Updating FPS-10 flash prommer software

Steps

1. Start *Phoenix* service software, and log in.
2. Choose the correct connection for your flash prommer: **File→Manage Connections...**
3. Choose **Flashing→Prommer maintenance** .
4. To update the **FPS-10** software, click **Update**, and select the appropriate file or *fpsxupd.ini* (for FPS-10) from *C:|Program Files|Nokia|Phoenix|Flash*.



Open
History
Desktop
My Computer
My Network P...
3.09.002
fps8upd.ini
fpsxupd.ini
Open
Cancel

Look in: Flash

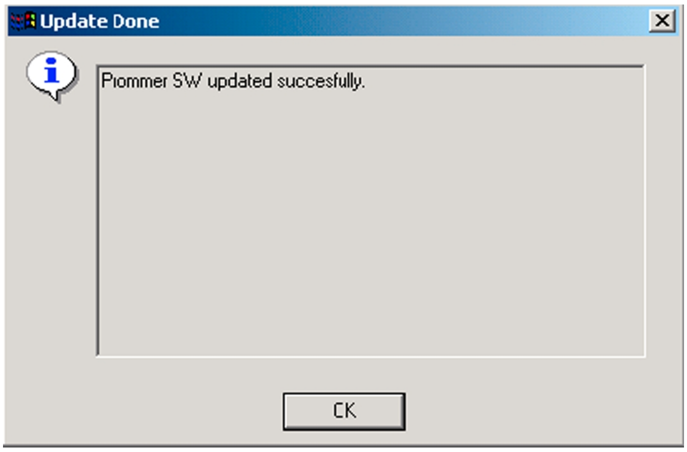
File name: fps8upd.ini

Files of type: Ini files (*.ini)

Figure 25 Flash directory window

Tip: All files can be loaded separately to the prommer used. To do this, click the right mouse button in the *Flash Box Files* pane and select the file type(s) to be loaded.

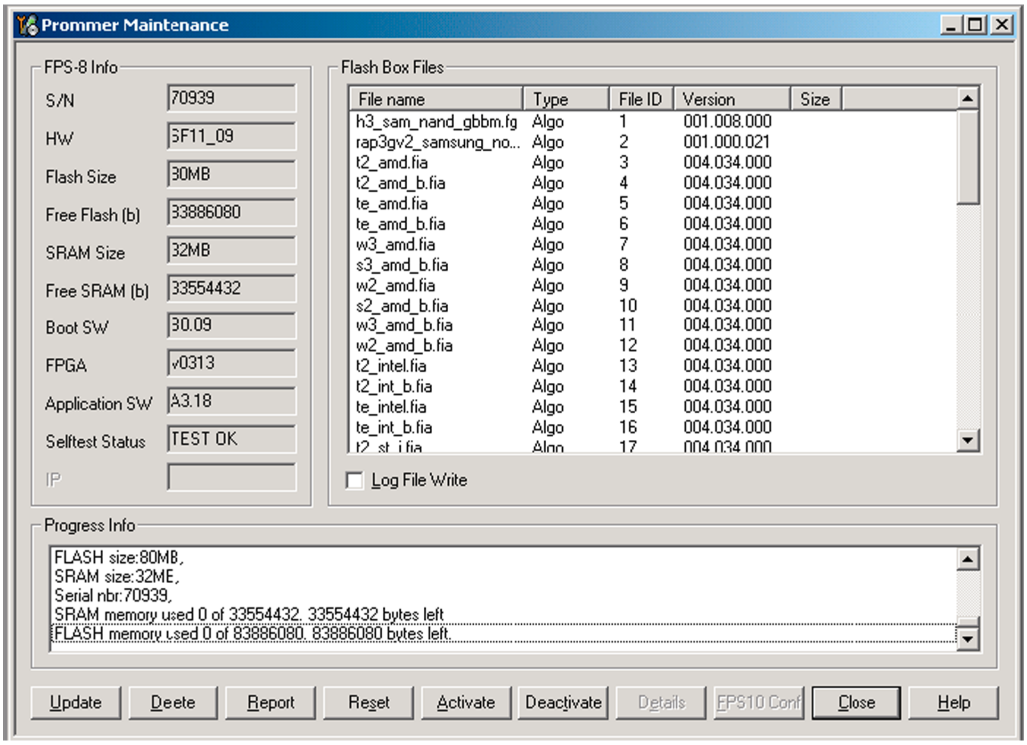
5. Click **OK**.


Update Done
OK

Prommer SW updated succesfully.

Figure 26 Prommer software update finished

6. To close the *Prommer Maintenance* window, click **Close**.


Prommer Maintenance
FPS-8 Info
Flash Box Files
Progress Info
Update
Deete
Report
Reset
Activate
Deactivate
Details
FPS10 Conf
Close
Help

S/N: 70939
HW: 5F11_09
Flash Size: 30MB
Free Flash (b): 33886080
SRAM Size: 32MB
Free SRAM (b): 33554432
Boot SW: 30.09
FPGA: v0313
Application SW: A3.18
Selftest Status: TEST OK
IP:

File name	Type	File ID	Version	Size
h3_sam_nand_gbbm.fg	Algo	1	001.008.000	
rap3gv2_samsung_no...	Algo	2	001.000.021	
t2_amd.fia	Algo	3	004.034.000	
t2_amd_b.fia	Algo	4	004.034.000	
te_amd.fia	Algo	5	004.034.000	
te_amd_b.fia	Algo	6	004.034.000	
w3_amd.fia	Algo	7	004.034.000	
s3_amd_b.fia	Algo	8	004.034.000	
w2_amd.fia	Algo	9	004.034.000	
s2_amd_b.fia	Algo	10	004.034.000	
w3_amd_b.fia	Algo	11	004.034.000	
w2_amd_b.fia	Algo	12	004.034.000	
t2_intel.fia	Algo	13	004.034.000	
t2_int_b.fia	Algo	14	004.034.000	
te_intel.fia	Algo	15	004.034.000	
te_int_b.fia	Algo	16	004.034.000	
t2_st_i.fia	Algo	17	004.034.000	

☐ Log File Write

```
FLASH size:80MB,
SRAM size:32ME,
Serial nbr:70939,
SRAM memory used 0 of 33554432. 33554432 bytes left
FLASH memory used 0 of 83886080. 83886080 bytes left.
```

Figure 27 *Prommer Maintenance* window

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4 — Service Tools and Service Concepts

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Figure 33 RF testing concept with RF coupler........4–16

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Service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-86, refer to various concepts.

	ACP-8E	Charger	0675195
	Charger (for Europe) Output: 5.3V DC, 500 mA.		
	CA-35S	Power cable	
	CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.		
	CA-53	USB connectivity cable	
	USB to system connector cable.		

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

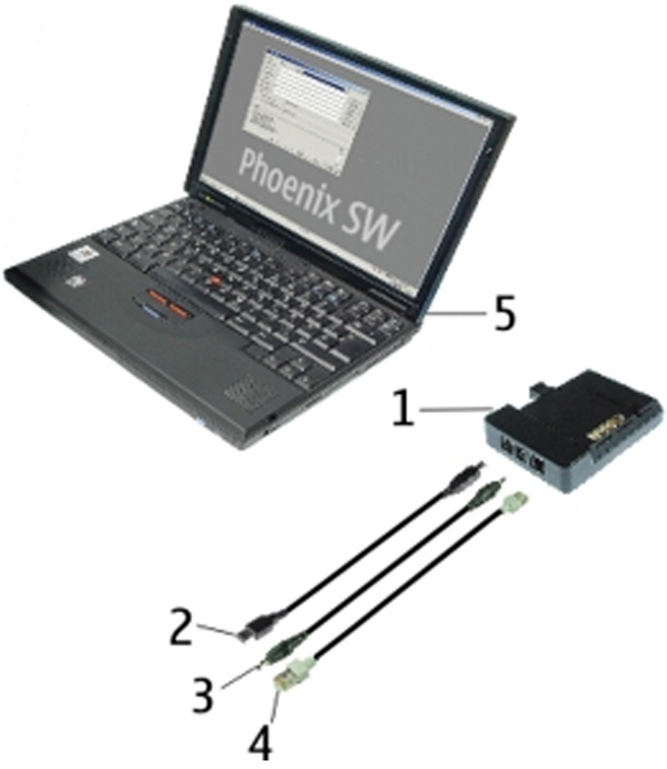
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

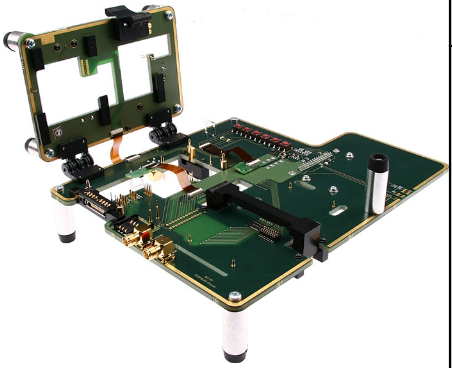
1. Connect a service tool (jig, flash adapter) to CU-4.
2. Connect CU-4 to your PC with a USB cable.
3. Connect supply voltage (12 V)
4. Connect an FBUS cable (if necessary).
5. Start Phoenix service software.

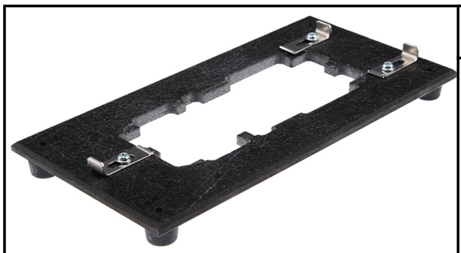
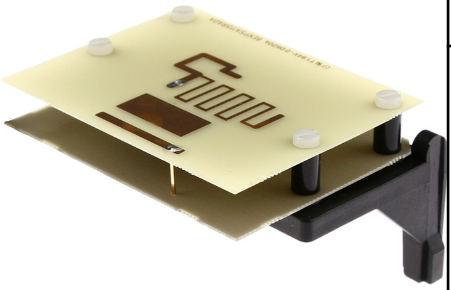
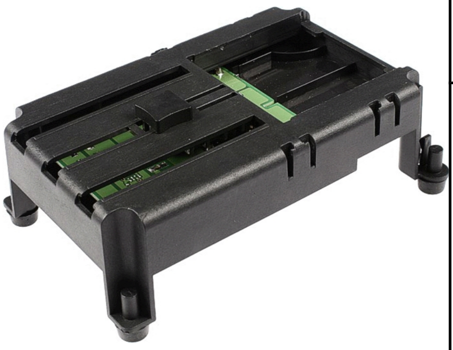


Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

	DAU-9S	MBUS cable	
	The MBUS cable DAU-9S has a modular connector and is used, for example, between the PC's serial port and module jigs, flash adapters or docking station adapters. **Note:** Docking station adapters valid for DCT4 products.		
	FLS-4S	Flash device	
	FLS-4S is a dongle and flash device incorporated into one package, developed specifically for POS use.		
	FPS-10	Flash prommer	
	FPS-10 interfaces with: • PC • Control unit • Flash adapter • Smart card FPS-10 flash prommer features: • Flash functionality for BB5 and DCT-4 terminals • Smart Card reader for SX-2 or SX-4 • USB traffic forwarding • USB to FBUS/Flashbus conversion • LAN to FBUS/Flashbus and USB conversion • Vusb output switchable by PC command FPS-10 sales package includes: • FPS-10 prommer • Power Supply with 5 country specific cords • USB cable		

<table>
<tr><td rowspan="2"> </td><td>FS-39</td><td>Product specific adapter</td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2"></td><td>MJ-81</td><td>Module jig</td><td></td></tr>
<tr><td colspan="3">MJ-81 is meant for component level troubleshooting.
The jig includes an RF interface for GSM, WCDMA and Bluetooth. In addition, it has the following features:
• Provides mechanical interface with Engine module
• Provides galvanic connection to all needed test pads in module
• Multiplexing between USB and FBUS media, controlled by Vusb
• UI test interface
• MMC interface
• Duplicated SIM connector
• Audio components: IHF, MIC, earpiece
• Connector for control unit
• Access for Pop-Port^{TM} system connector</td></tr>
<tr><td rowspan="2"> </td><td>PCS-1</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled operating voltage.</td></tr>
<tr><td rowspan="2"> </td><td>PKD-1</td><td>SW security device</td><td></td></tr>
<tr><td colspan="3">SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC.
Without the device, it is not possible to use the service software.
Printer or any such device can be connected to the PC through the device if needed.</td></tr>
</table>

	RJ-152	Soldering jig		RJ-152 is used as a soldering jig for the engine module.
	SA-115	RF coupler		SA-115 is a coupler for GSM RF testing. It is used together with the FS-12 flash adapter.
	SS-46	Interface adapter		SS-46 acts as an interface adapter between the flash adapter and FPS-10.
	SS-62	Generic flash adapter base for BB5		• generic base for flash adapters and couplers • SS-62 equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using galvanic connector or coupler • multiplexing between USB and FBUS media, controlled by VUSB
	SX-4	Smart card		SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.

<table>
<tr><td rowspan="2"> </td><td>XCS-4</td><td>Modular cable</td><td></td></tr>
<tr><td colspan="3">XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.</td></tr>
<tr><td rowspan="2"> </td><td>XRS-6</td><td>RF cable</td><td></td></tr>
<tr><td colspan="3">The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.
SMA to N-Connector approximately 610 mm.
Attenuation for:
• GSM850/900: 0.3+-0.1 dB
• GSM1800/1900: 0.5+-0.1 dB
• WLAN: 0.6+-0.1dB</td></tr>
</table>

Service concepts

Flash concept with FPS-10

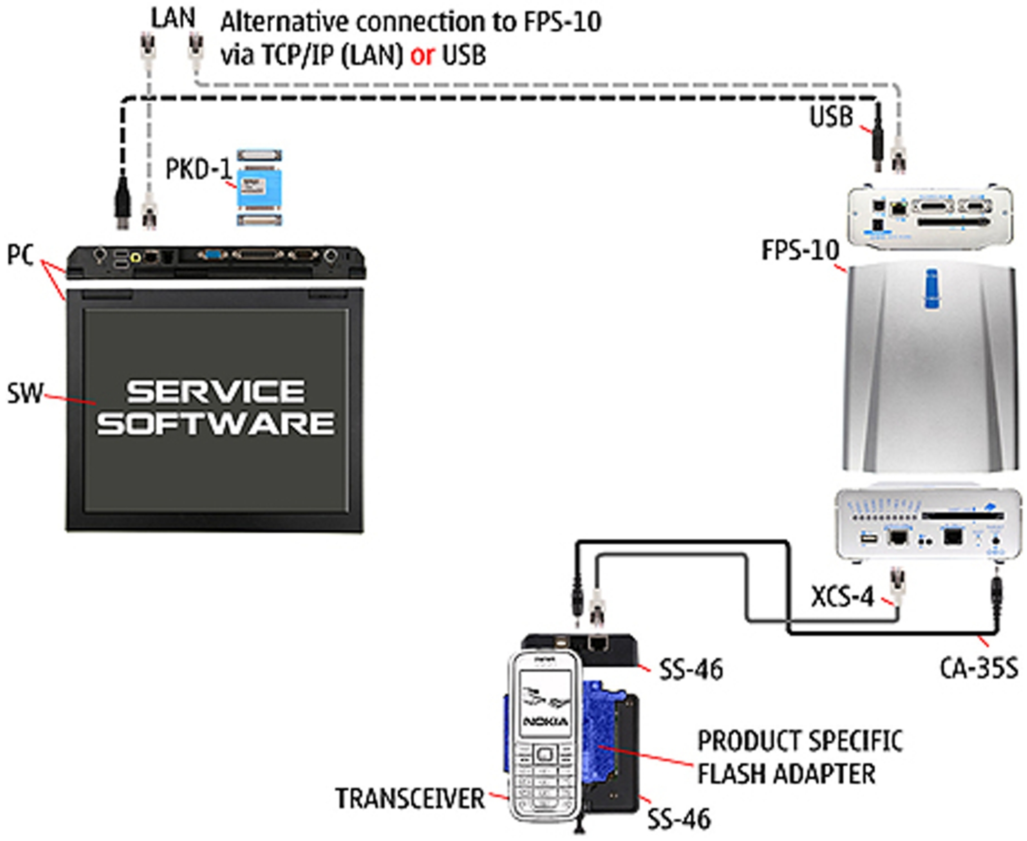

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
PC
FPS-10
SW
SERVICE SOFTWARE
XCS-4
SS-46
CA-35S
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
SS-46

Figure 28 Basic flash concept with FPS-10

Type	Description
SS-46	Interface adapter
FS-39	Flash adapter
CA-35S	Power cable
XCS-4	Modular cable
FPS-10	Flash prommer box
	USB cable
PKD-1	SW security device

MJ-81 module jig concept

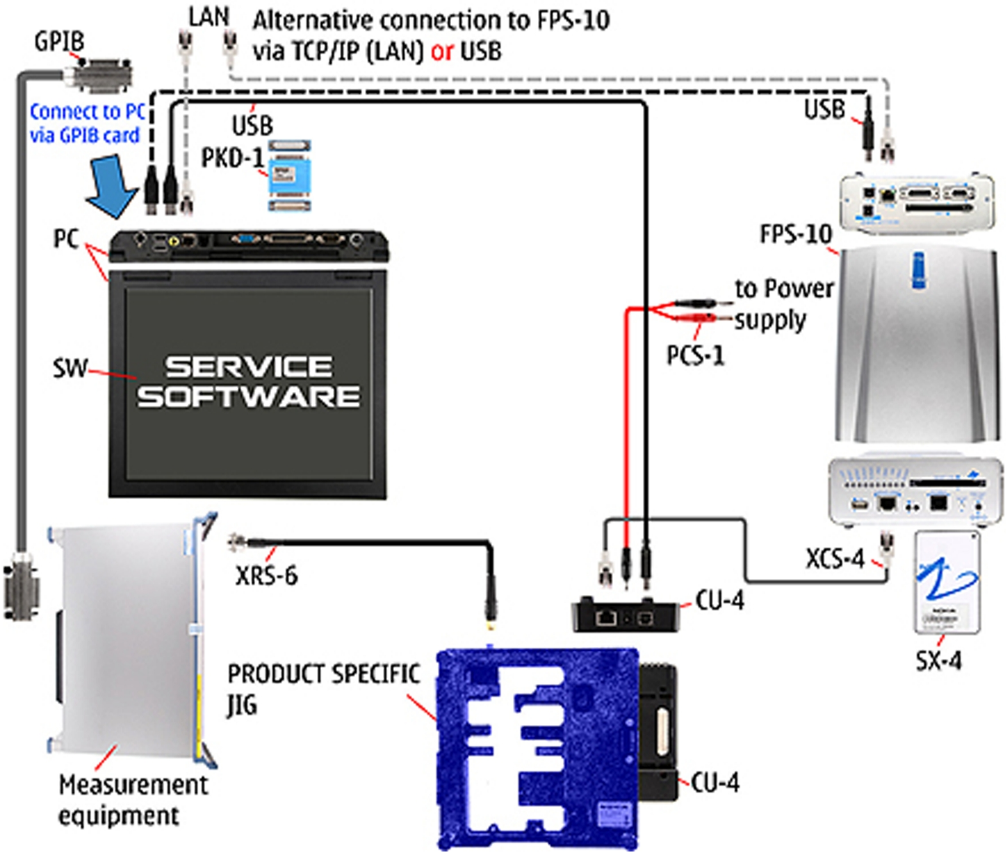

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
GPIB
Connect to PC
via GPIB card
USB
PKD-1
USB
PC
FPS-10
to Power
supply
PCS-1
SW
SERVICE
SOFTWARE
XRS-6
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC
JIG
CU-4
Measurement
equipment

Figure 29 MJ-81 module jig service concept

Type	Description
MJ-81	Module jig
CU-4	Control unit
FPS-10	Flash prommer box
SX-4	Smart card
XCS-4	Modular cable
PCS-1	DC power cable
	USB cable
	USB cable
	GPIB control cable
XRS-6	RF cable
PKD-1	SW security device
	Measurement equipment

POS (Point of Sale) flash concept

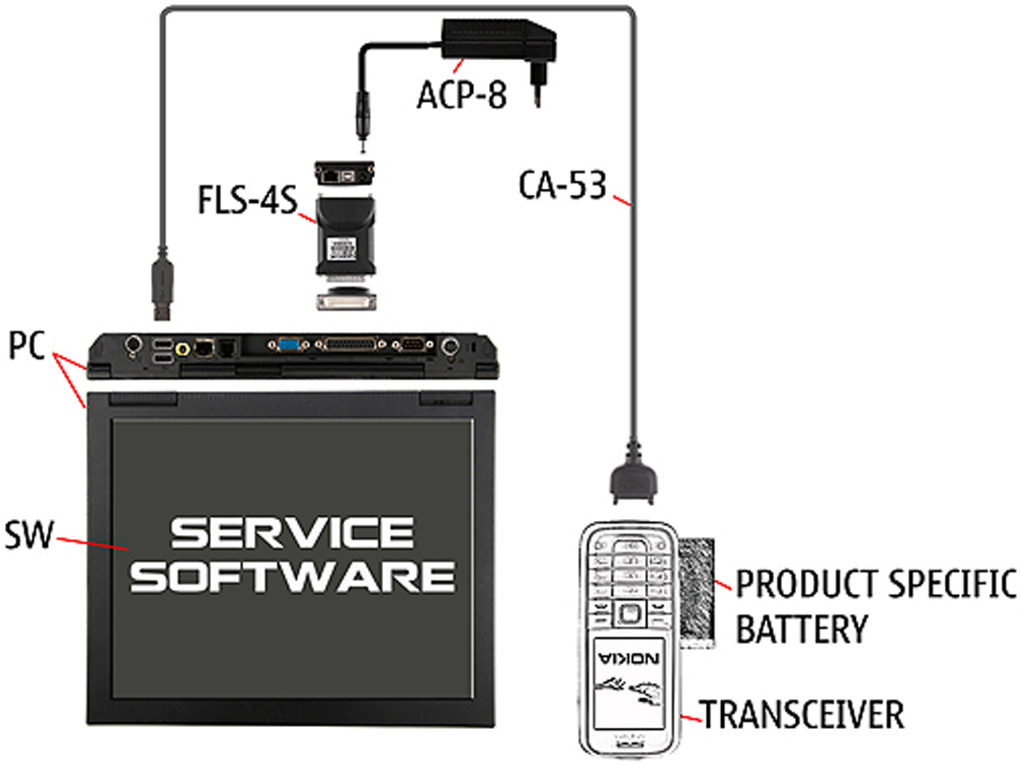

ACP-8
FLS-4S
CA-53
PC
SW
SERVICE SOFTWARE
PRODUCT SPECIFIC BATTERY
TRANSCEIVER

Figure 30 POS flash concept

Type	Description
CA-53	USB connectivity cable
FLS-4S	POS flash dongle
ACP-8	Power adapter
BL-5B	Battery

Service concept for RF testing and RF/BB tuning

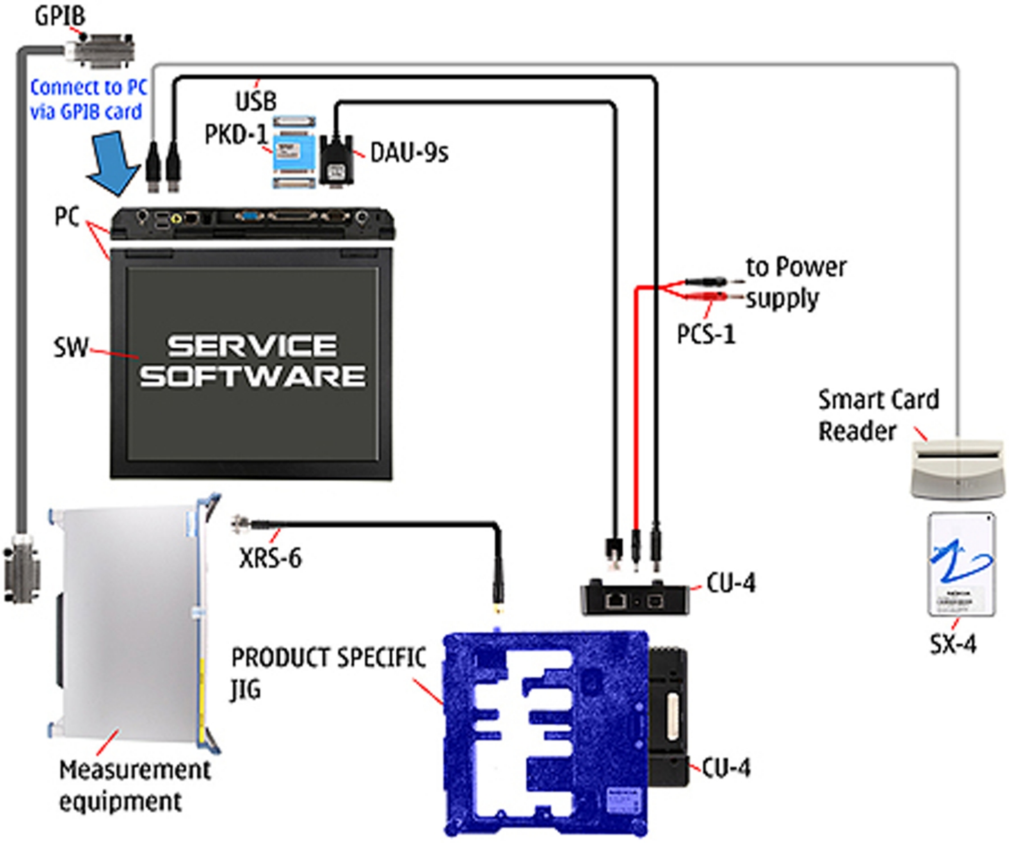

GPIB
Connect to PC via GPIB card
USB
PKD-1
DAU-9s
PC
SW
SERVICE SOFTWARE
to Power supply
PCS-1
Smart Card Reader
XRS-6
CU-4
SX-4
PRODUCT SPECIFIC JIG
CU-4
Measurement equipment

Figure 31 Service concept for RF testing and RF/BB tuning

Type	Description
CU-4	Control unit
DAU-9s	MBUS cable
PCS-1	DC power cable
	USB cable
MJ-81	Module jig
SX-4	Smart card
	Standard USB cable + Smart card reader
XRS-6	RF cable
	Measurement equipment
PKD-1	SW security device
	GPIB control cable

CU-4 flash concept with FPS-10

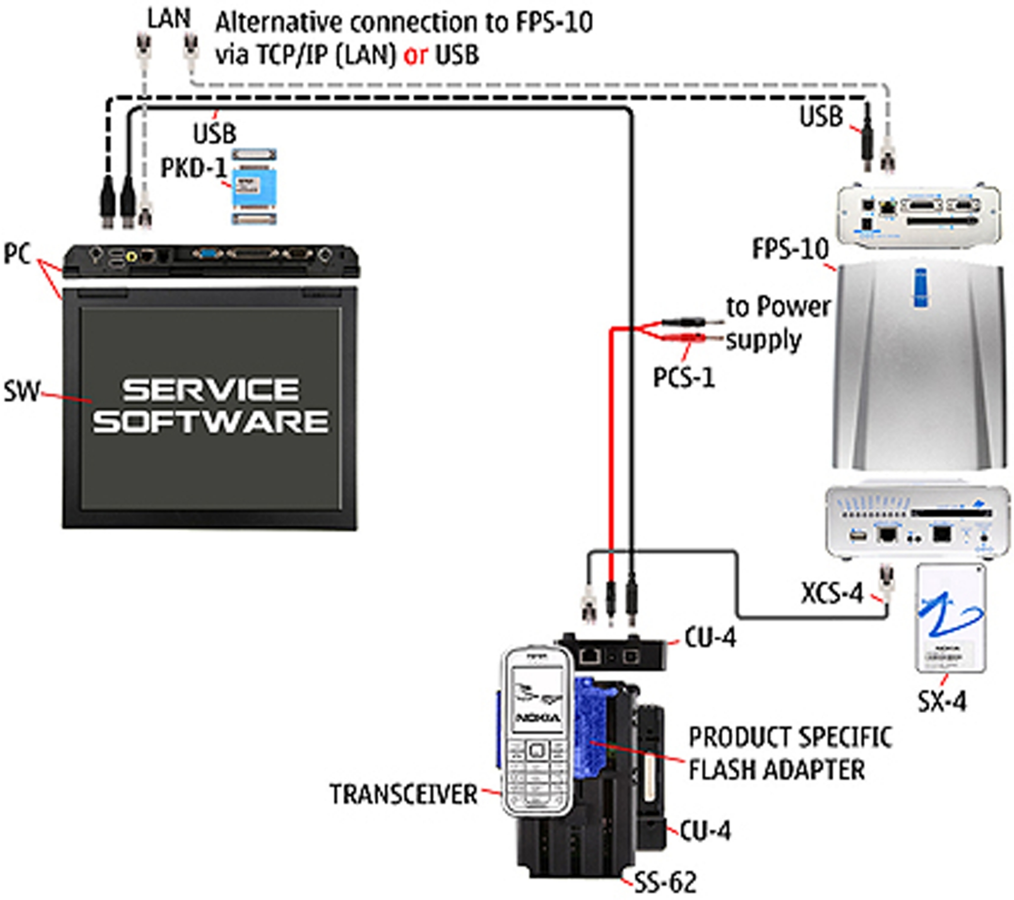

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
USB
PC
SERVICE SOFTWARE
SW
FPS-10
to Power supply
PCS-1
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC FLASH ADAPTER
TRANSCEIVER
CU-4
SS-62

Figure 32 CU-4 flash concept with FPS-10

Type	Description
CU-4	Control unit
XCS-4	Modular cable
PCS-1	Power cable
	USB cable
FPS-10	Flash prommer box
SX-4	Smart card
	Standard USB cable
SS-62	Module jig
FS-39	Flash adapter
PKD-1	SW security device

RF testing concept with RF coupler

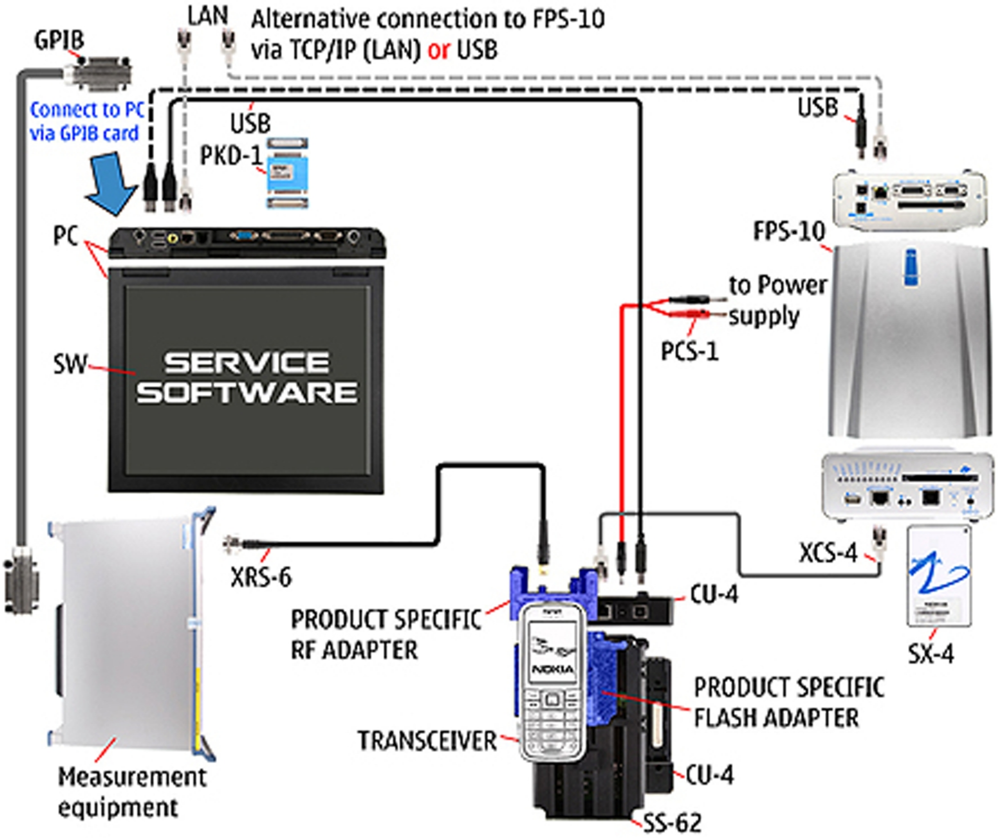

LAN
Alternative connection to FPS-10 via TCP/IP (LAN) or USB
GPIB
Connect to PC via GPIB card
USB
PKD-1
USB
FPS-10
PC
to Power supply
PCS-1
SW
SERVICE SOFTWARE
XRS-6
XCS-4
CU-4
PRODUCT SPECIFIC RF ADAPTER
SX-4
PRODUCT SPECIFIC FLASH ADAPTER
TRANSCEIVER
CU-4
Measurement equipment
SS-62

Figure 33 RF testing concept with RF coupler

Type	Description
CU-4	Control unit
XCS-4	Modular cable
PCS-1	Power cable
	USB cable
SX-4	Smart card
FPS-10	Flash prommer box
	USB cable
SS-62	Module jig
FS-39	Flash adapter
SA-115	RF coupler
XRS-6	RF cable
	Measurement equipment
	GPIB control cable
PKD-1	SW security device

5 — Disassembly / Reassembly Instructions

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Assembly hints....................5–9

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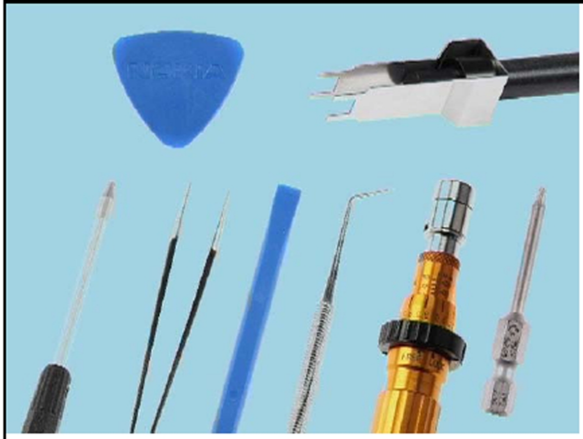
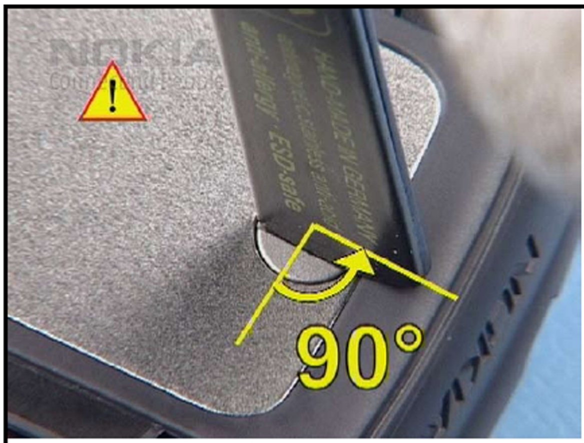
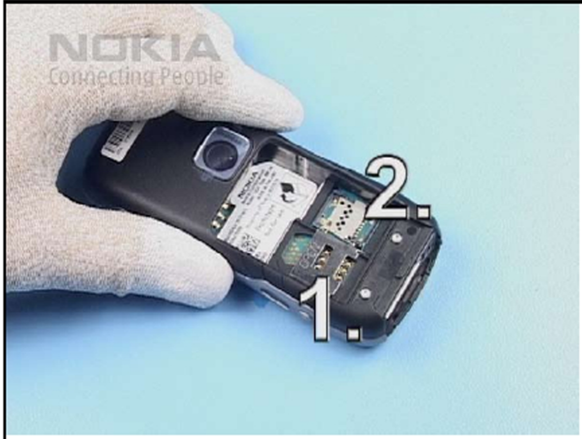
Disassembly instructions



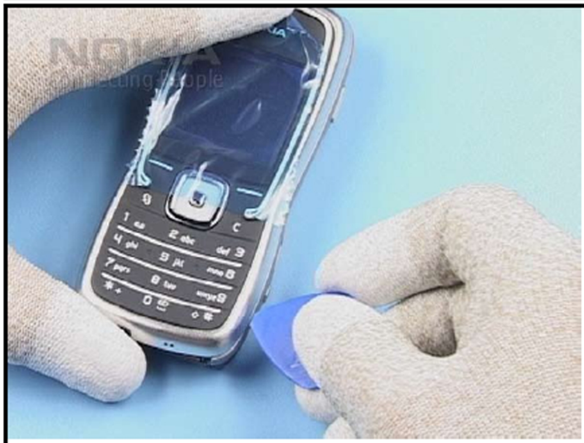
1. Needed tools : a Torx Plus size 6 screwdriver, metal tweezers, the dental pick, the SS-93 opening tool, a torque driver, a Torx size 6 plus bit, the SRT-6 and the SS-45 camera removal tool.



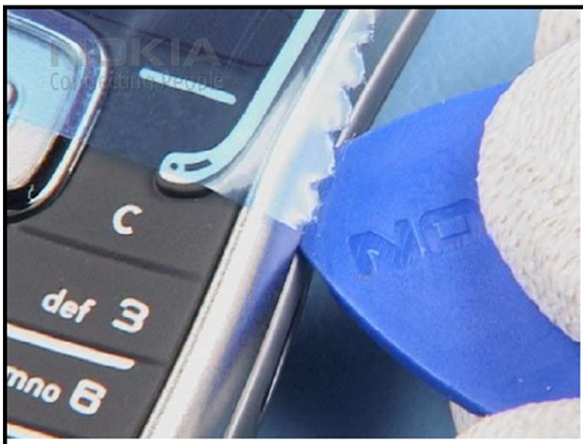
2. Unlock and remove the BATTERY COVER. Do not turn the BATTERY COVER LOCKING SCREW over 90°.



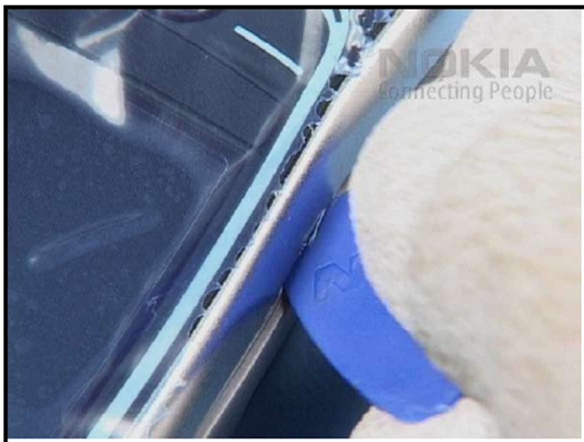
3. Undo the screws in the order shown.



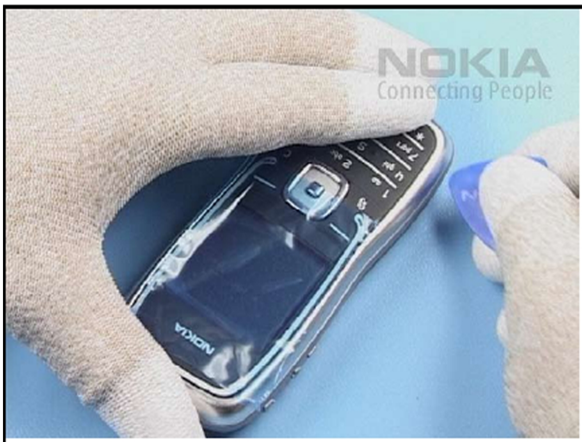
4. Place the SRT-6 between the A-COVER METAL FRAME and the B-COVER ASSY.



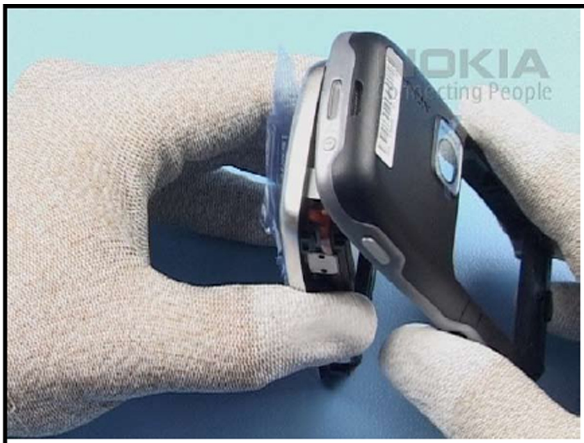
5. Slide the SRT-6 along the edge to the middle of the cover.



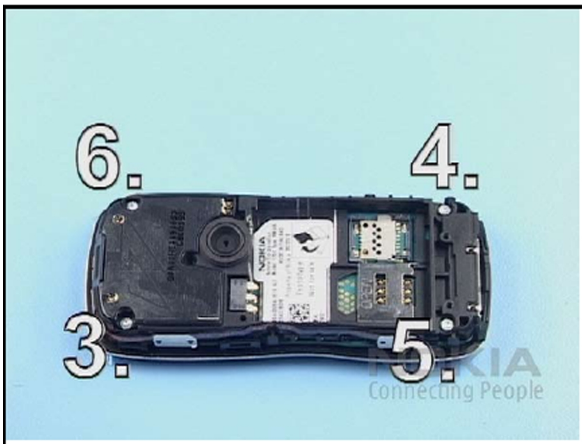
6. To unlock the A-COVER METAL ASSY lever it out with SRT-6 as shown.



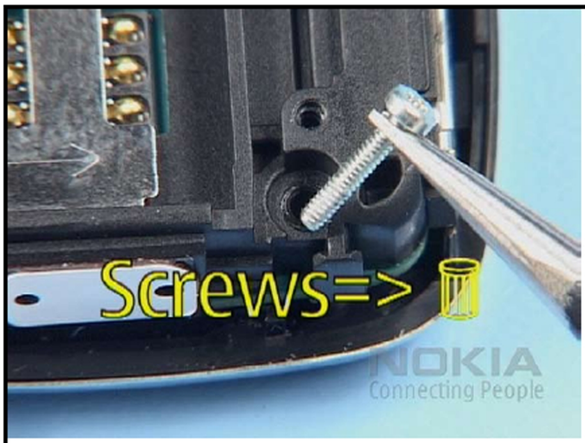
7. Do the same on the other side.



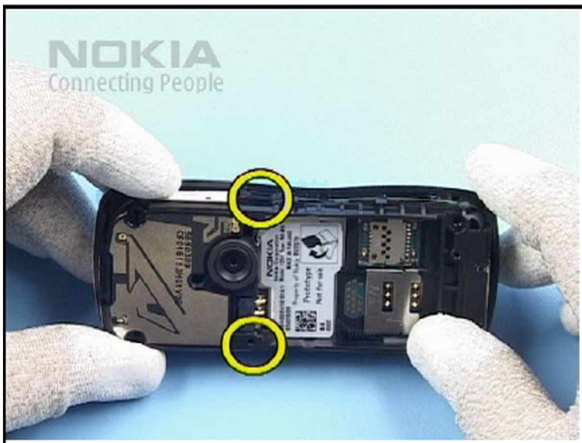
8. Separate the parts from each other.



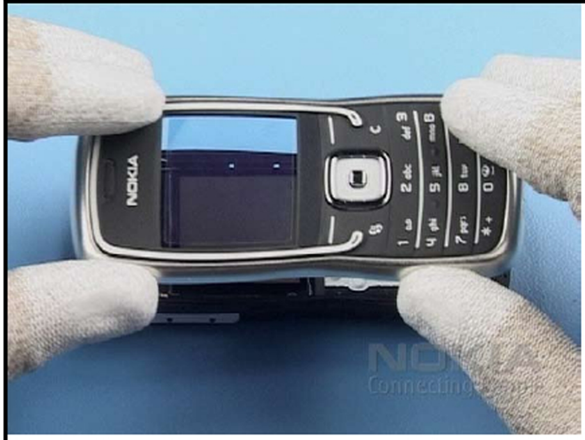
9. Undo the screws in the shown order.



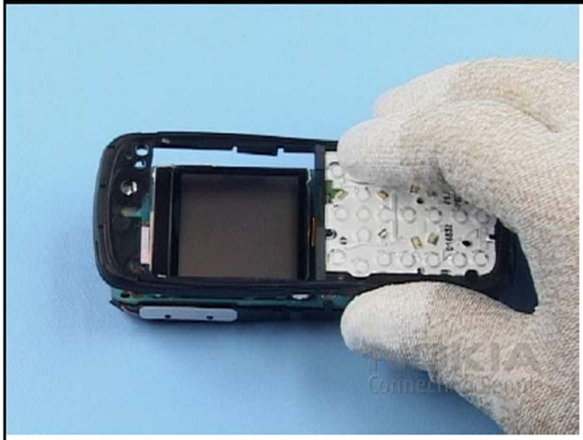
10. Discard the screws.

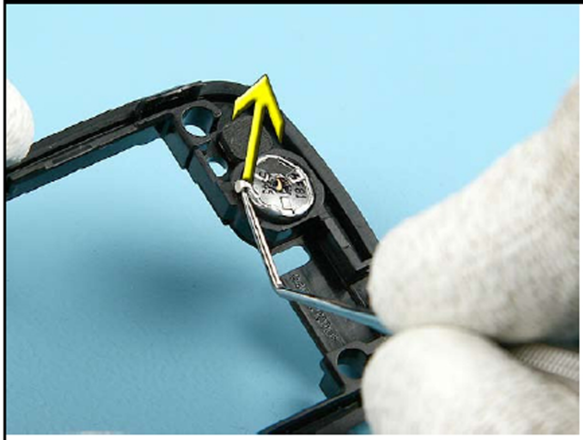


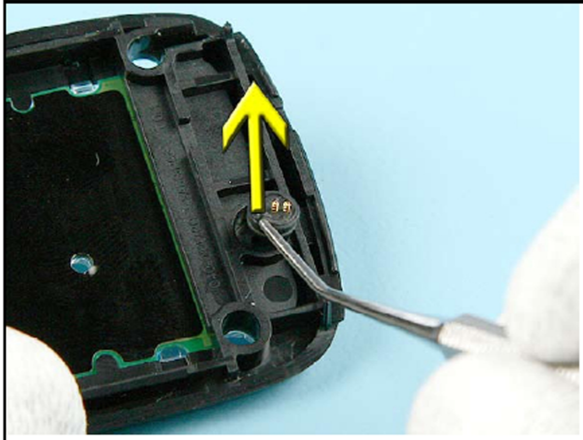
11. Unlock the A-COVER ASSY...

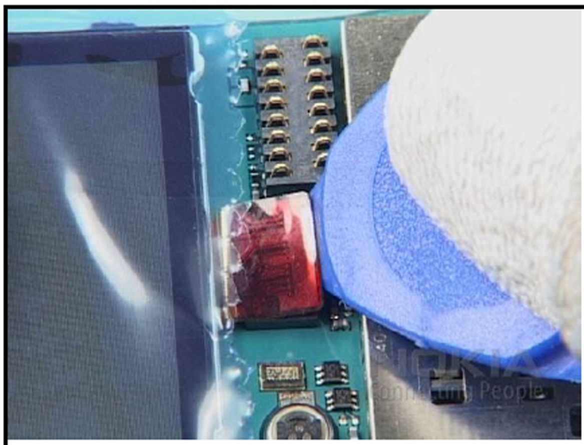


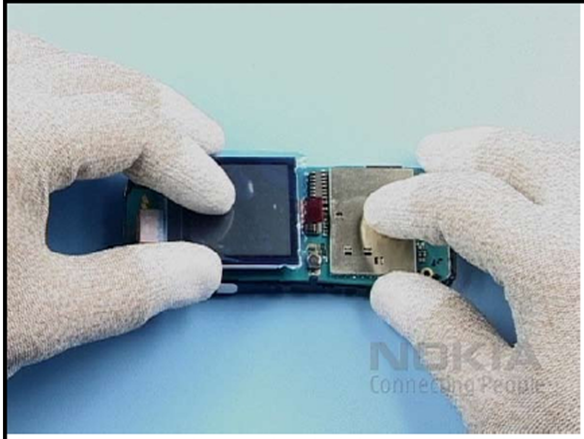
12. ...and remove the A-COVER METAL FRAME.

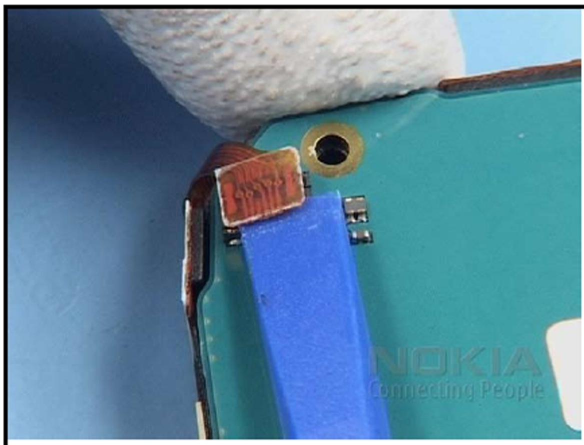

13. Remove the A-COVER ASSY.

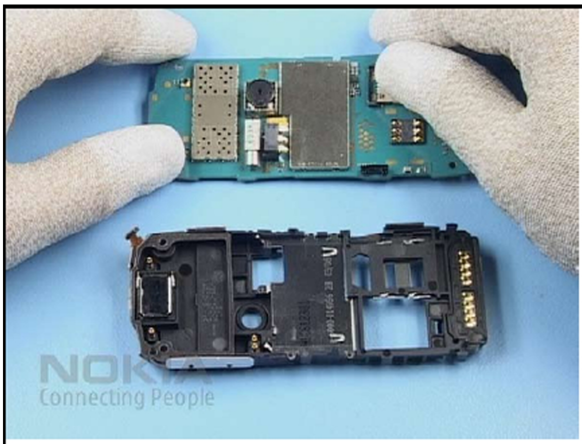

14. Remove the EARPIECE with the dental pick.


15. Remove the MICROPHONE with the dental pick.

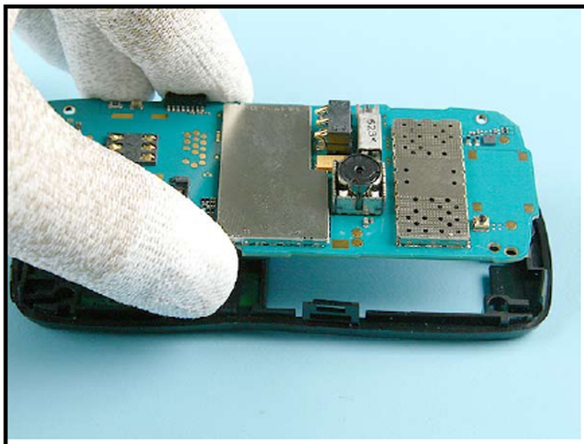

16. Gently, open the LCD CONNECTOR...


17. ...and remove the LCD MODULE ASSY.

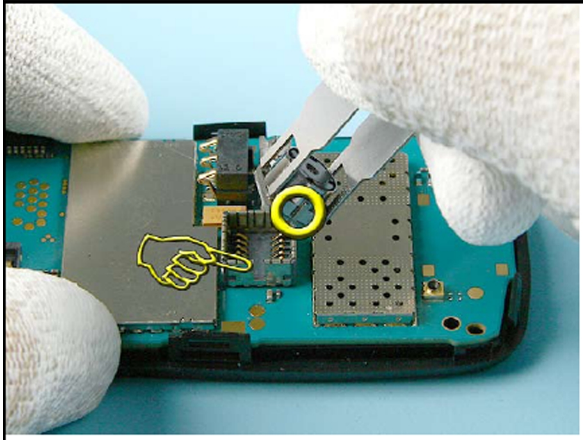

18. Open the SIDE FLEX connector.



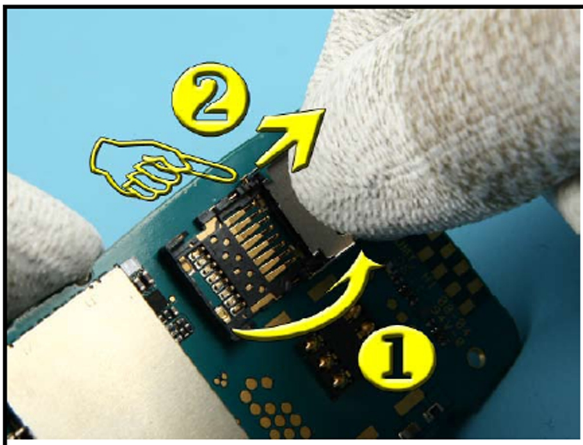
19. Now, remove the ENGINE MODULE.



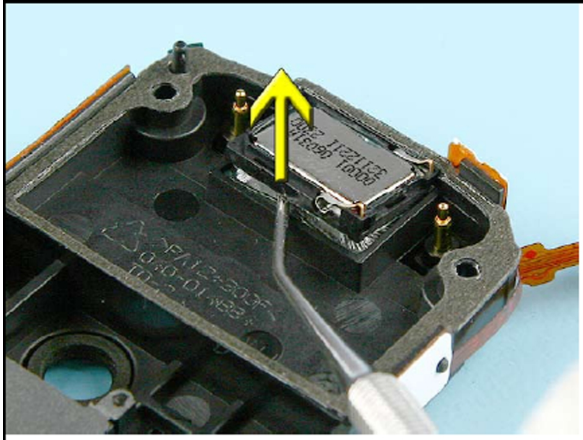
20. Use the A-COVER ASSY as an support when removing the CAMERA MODULE.



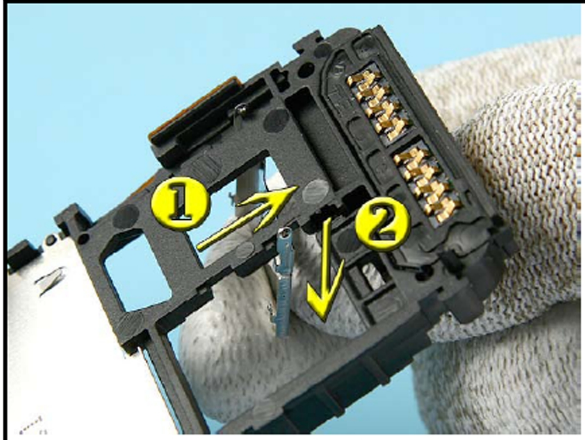
21. Remove the CAMERA MODULE with the SS-45 camera removal tool. Note the guide pin for the reassembling procedure.



22. Remove the MICRO SD DOOR in the shown order.



23. Remove the IHF SPEAKER DONAU with the dental pick.

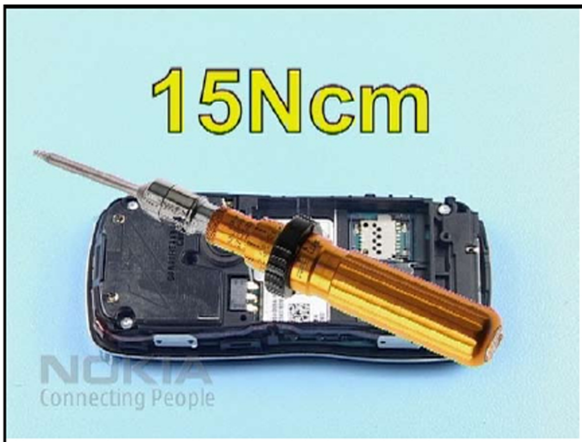


24. Remove the SIM COVER in the shown order.

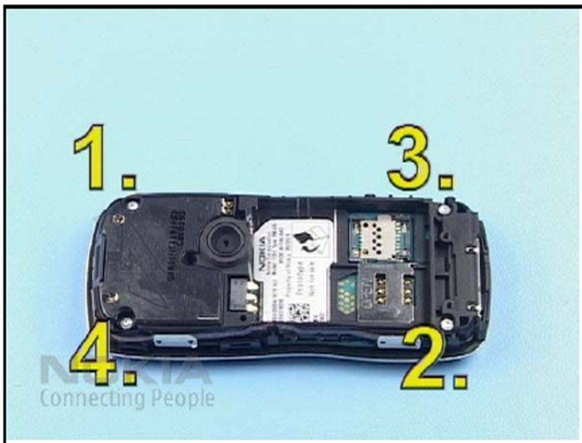
Note: Reassembly takes place in the reverse order. Note the assembly hints in the next chapter.

Assembly hints

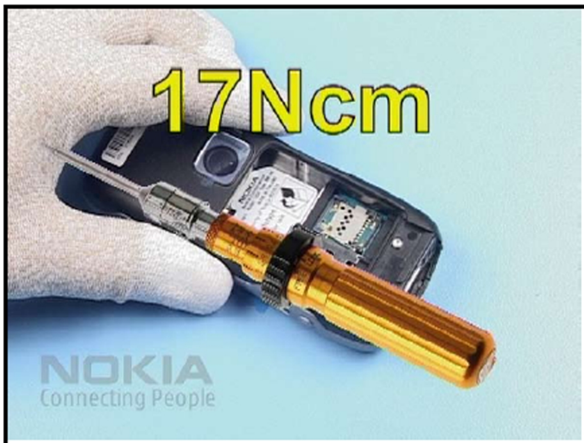
1. Always use new screws when assembling the unit.



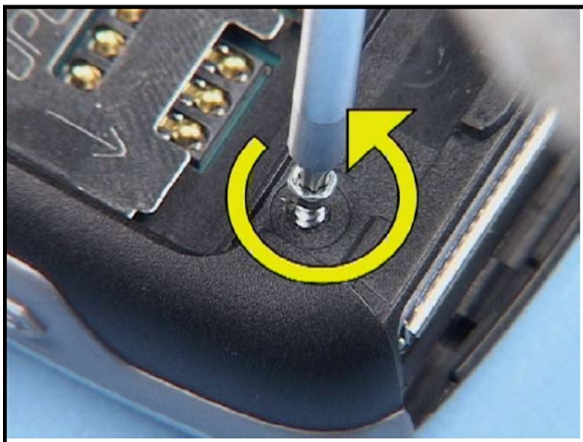
2. Set the torque driver to the torque value of 15Ncm.



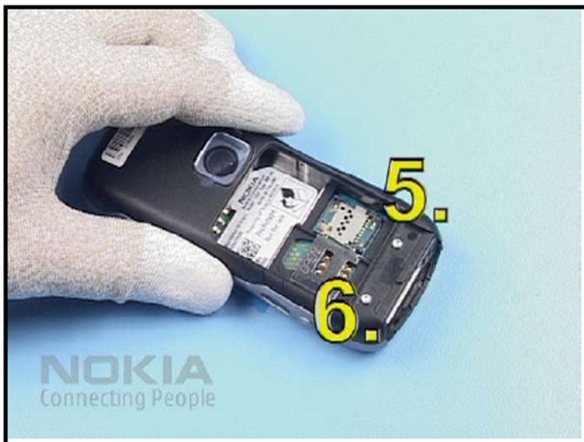
3. Tighten the screws in the order shown.



4. Set a torque value of 17Ncm for the last two screws.



5. To avoid damaging the plastic threads, first turn the screws slightly left to engage the thread and then tighten them lightly.



6. Tighten the screws in the order shown.

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6 — BB Troubleshooting and Manual Tuning Guide

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Figure 44 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.... 6–38

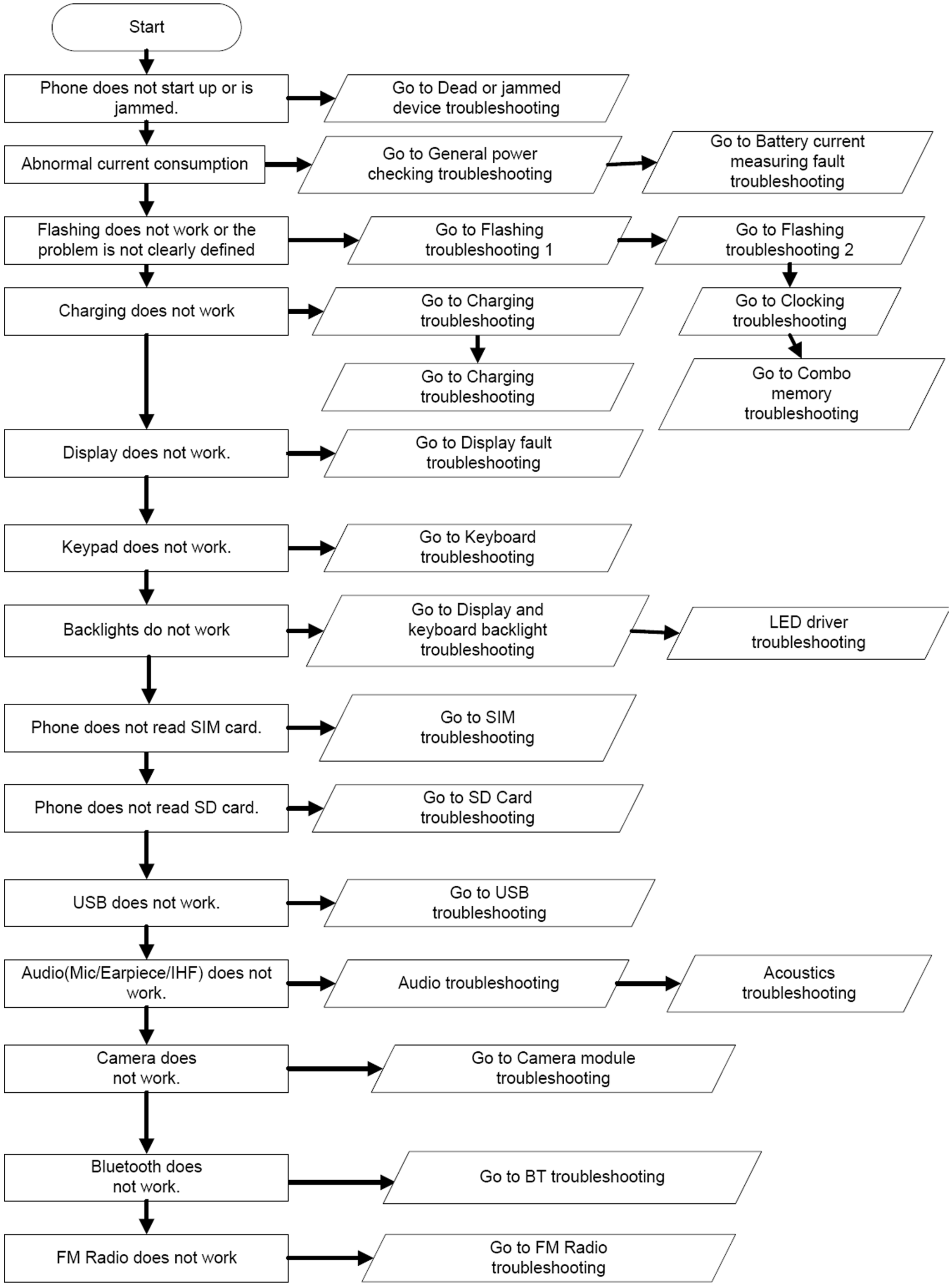
Baseband troubleshooting

Context

This section is intended to be a guide for localising and repairing electrical faults. The fault repairing is divided into troubleshooting paths.

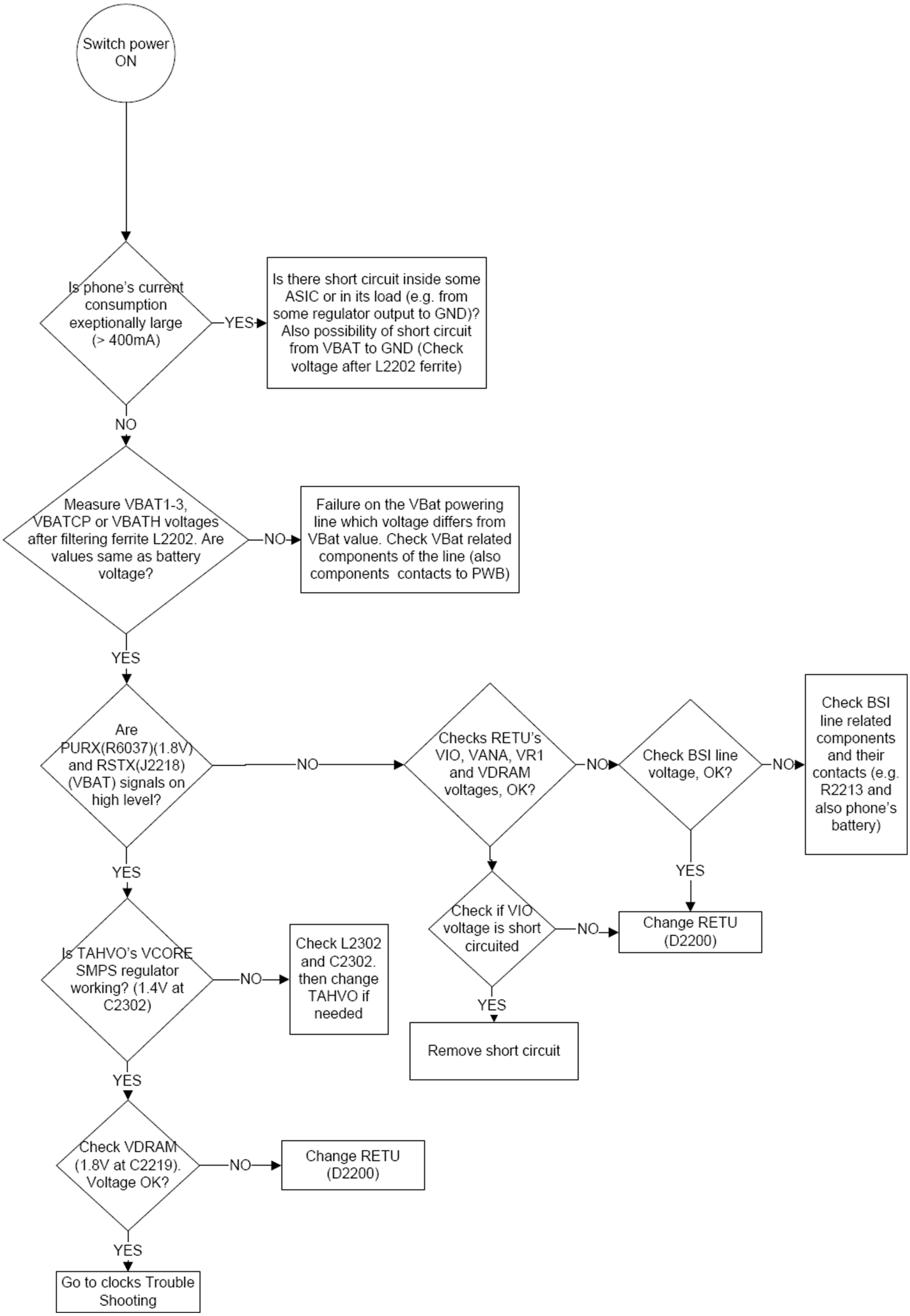
The following main troubleshooting tree describes the different baseband troubleshooting paths to be followed in fault situations.

Troubleshooting flow


Start
Phone does not start up or is jammed.
Go to Dead or jammed device troubleshooting
Abnormal current consumption
Go to General power checking troubleshooting
Go to Battery current measuring fault troubleshooting
Flashing does not work or the problem is not clearly defined
Go to Flashing troubleshooting 1
Go to Flashing troubleshooting 2
Go to Clocking troubleshooting
Go to Combo memory troubleshooting
Charging does not work
Go to Charging troubleshooting
Go to Charging troubleshooting
Display does not work.
Go to Display fault troubleshooting
Keypad does not work.
Go to Keyboard troubleshooting
Backlights do not work
Go to Display and keyboard backlight troubleshooting
LED driver troubleshooting
Phone does not read SIM card.
Go to SIM troubleshooting
Phone does not read SD card.
Go to SD Card troubleshooting
USB does not work.
Go to USB troubleshooting
Audio(Mic/Earpiece/IHF) does not work.
Audio troubleshooting
Acoustics troubleshooting
Camera does not work.
Go to Camera module troubleshooting
Bluetooth does not work.
Go to BT troubleshooting
FM Radio does not work
Go to FM Radio troubleshooting

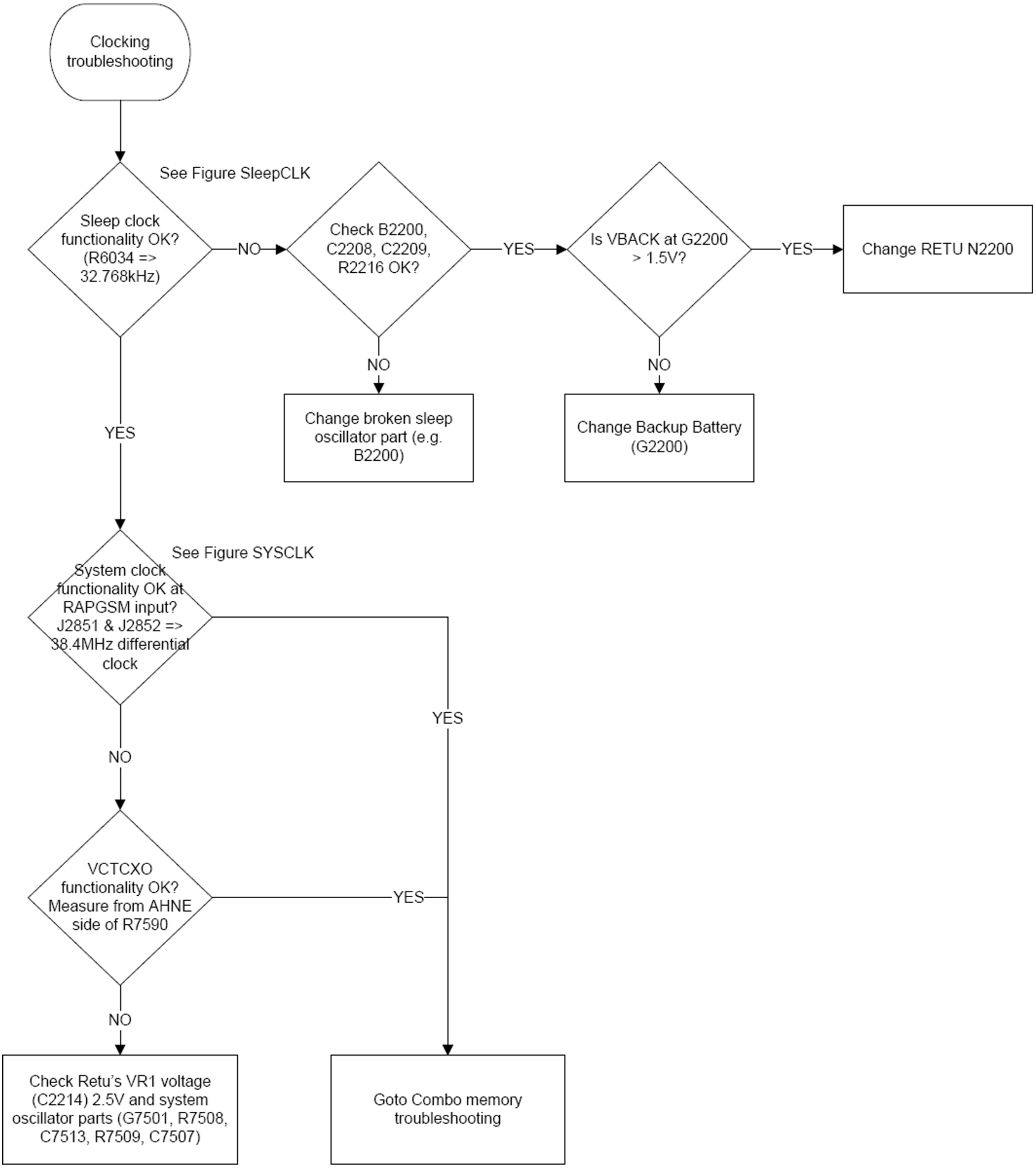
General power checking troubleshooting

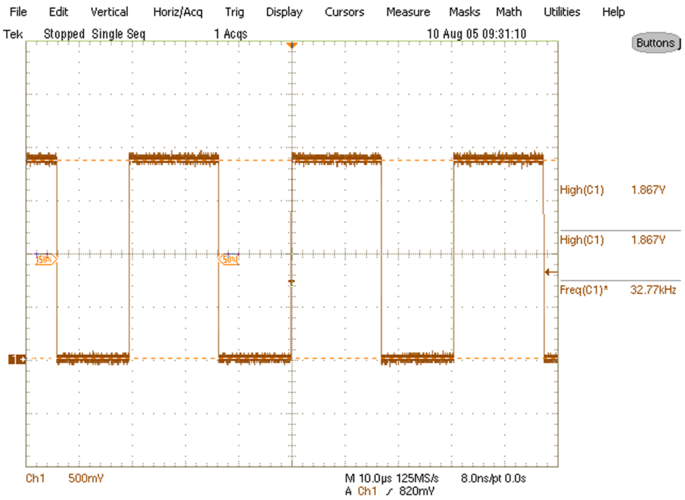
Troubleshooting flow


Switch power ON
Is phone's current consumption exceptionally large (> 400mA)
YES
Is there short circuit inside some ASIC or in its load (e.g. from some regulator output to GND)? Also possibility of short circuit from VBAT to GND (Check voltage after L2202 ferrite)
NO
Measure VBAT1-3, VBATCP or VBATH voltages after filtering ferrite L2202. Are values same as battery voltage?
NO
Failure on the VBat powering line which voltage differs from VBat value. Check VBat related components of the line (also components contacts to PWB)
YES
Are PURX(R6037)(1.8V) and RSTX(J2218) (VBAT) signals on high level?
NO
Checks RETU's VIO, VANA, VR1 and VDRAM voltages, OK?
NO
Check BSI line voltage, OK?
NO
Check BSI line related components and their contacts (e.g. R2213 and also phone's battery)
YES
Change RETU (D2200)
Check if VIO voltage is short circuited
NO
YES
Remove short circuit
YES
Is TAHVO's VCORE SMPS regulator working? (1.4V at C2302)
NO
Check L2302 and C2302. then change TAHVO if needed
YES
Check VDRAM (1.8V at C2219). Voltage OK?
NO
Change RETU (D2200)
YES
Go to clocks Trouble Shooting

Clocking troubleshooting

Troubleshooting flow


Clocking troubleshooting
See Figure SleepCLK
Sleep clock functionality OK? (R6034 => 32.768kHz)
NO
Check B2200, C2208, C2209, R2216 OK?
YES
Is VBACK at G2200 > 1.5V?
YES
Change RETU N2200
NO
Change broken sleep oscillator part (e.g. B2200)
NO
Change Backup Battery (G2200)
YES
See Figure SYSCLK
System clock functionality OK at RAPGSM input? J2851 & J2852 => 38.4MHz differential clock
YES
NO
VCTCXO functionality OK? Measure from AHNE side of R7590
YES
NO
Check Retu's VR1 voltage (C2214) 2.5V and system oscillator parts (G7501, R7508, C7513, R7509, C7507)
Goto Combo memory troubleshooting

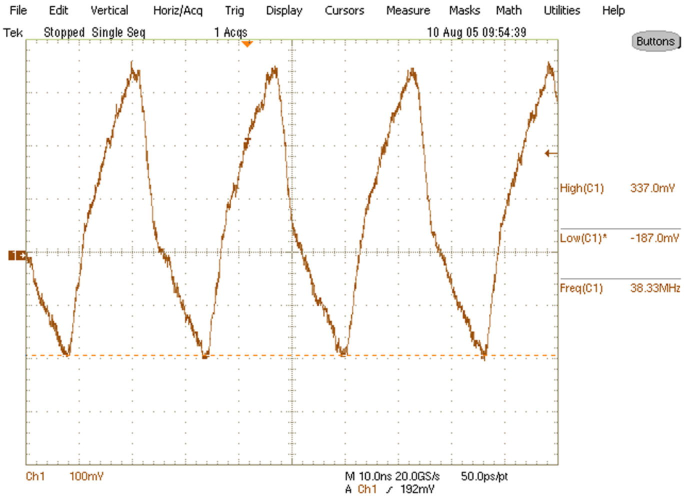

File
Edit
Vertical
Horiz/Acq
Trig
Display
Cursors
Measure
Masks
Math
Utilities
Help
Buttons

Tek Stopped Single Seq 1 Acqs 10 Aug 05 09:31:10

High(C1) 1.867V
High(C1) 1.867V
Freq(C1)* 32.77kHz

Ch1 500mV M 10.0µs 125MS/s 8.0ns/pt 0.0s
A Ch1 ⁄ 820mV

Figure 34 SleepCLK


File
Edit
Vertical
Horiz/Acq
Trig
Display
Cursors
Measure
Masks
Math
Utilities
Help
Buttons

Tek Stopped Single Seq 1 Acqs 10 Aug 05 09:54:39

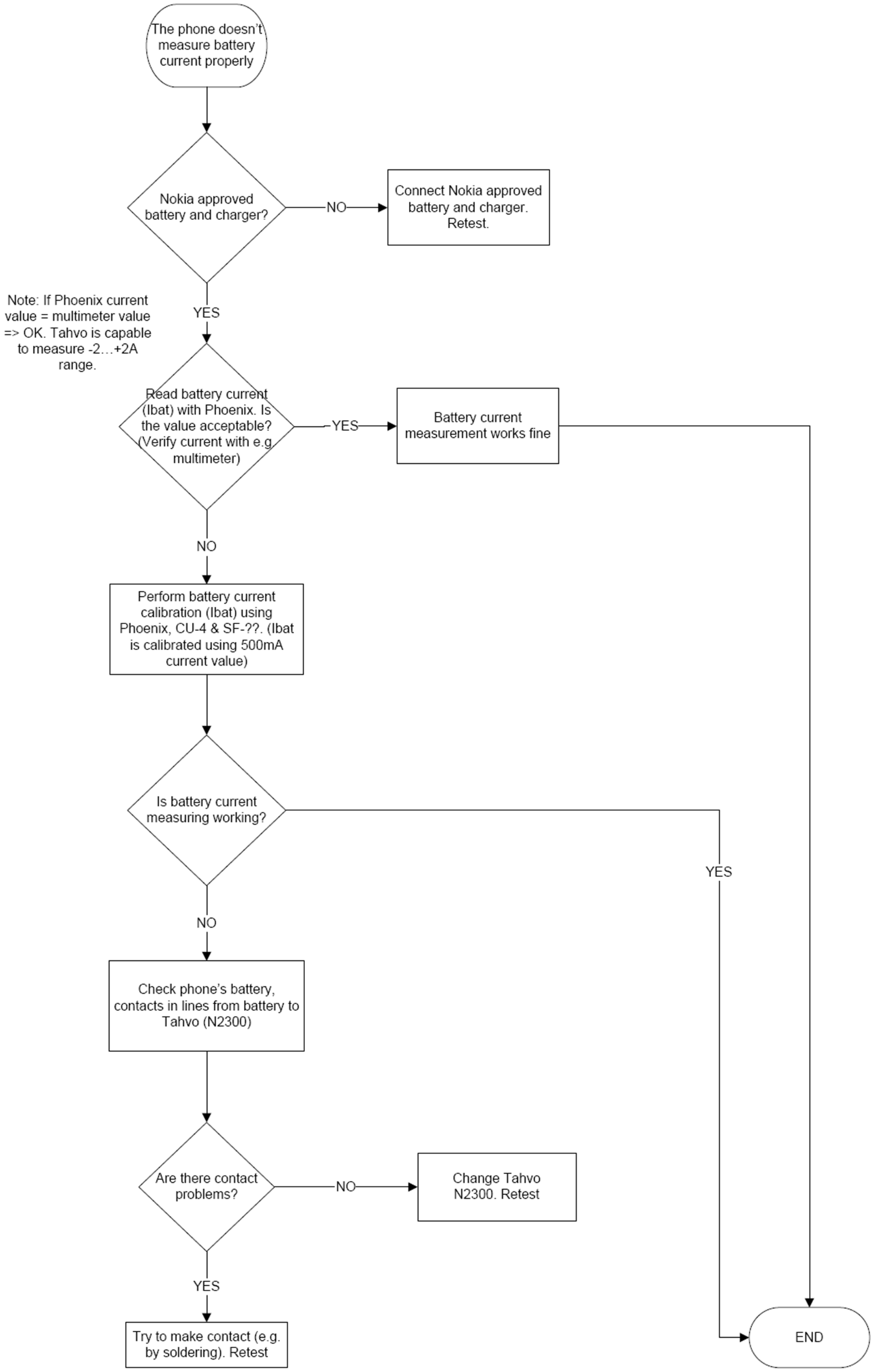
High(C1) 337.0mV
Low(C1)* -187.0mV
Freq(C1) 38.33MHz

Ch1 100mV M 10.0ns 20.0GS/s 50.0ps/pt
A Ch1 ⁄ 192mV

Figure 35 SYSCLK

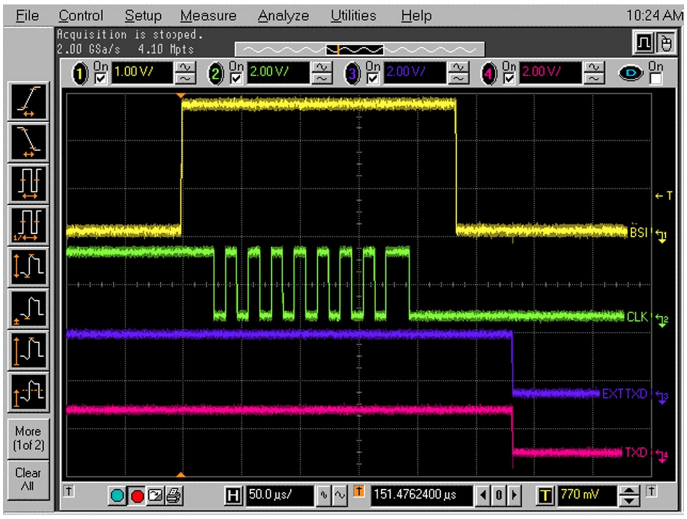
Battery current measuring fault troubleshooting

Troubleshooting flow


The phone doesn't measure battery current properly
Nokia approved battery and charger?
NO
Connect Nokia approved battery and charger. Retest.
YES
Note: If Phoenix current value = multimeter value => OK. Tahvo is capable to measure -2…+2A range.
Read battery current (Ibat) with Phoenix. Is the value acceptable? (Verify current with e.g. multimeter)
YES
Battery current measurement works fine
NO
Perform battery current calibration (Ibat) using Phoenix, CU-4 & SF-??. (Ibat is calibrated using 500mA current value)
Is battery current measuring working?
YES
NO
Check phone's battery, contacts in lines from battery to Tahvo (N2300)
Are there contact problems?
NO
Change Tahvo N2300. Retest
YES
Try to make contact (e.g. by soldering). Retest
END

Flash programming fault troubleshooting

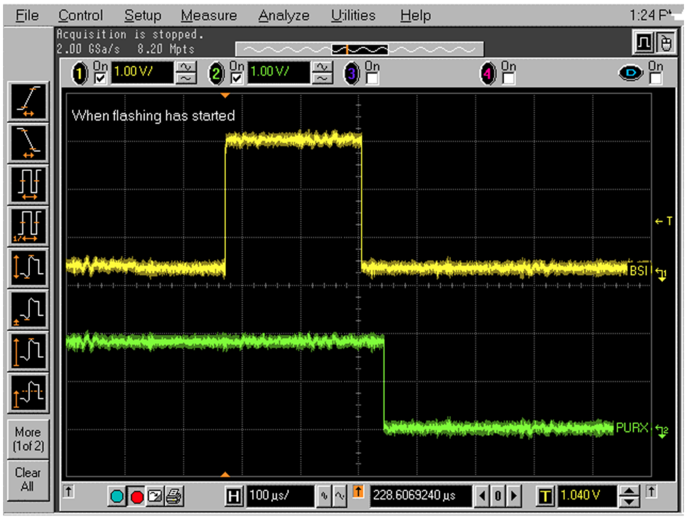
Troubleshooting flow


File
Control
Setup
Measure
Analyze
Utilities
Help
10:24 AM
On
1.00 V/
2.00 V/
2.00 V/
2.00 V/
BSI
CLK
EXTTXD
TXD
More (1of 2)
Clear All
H
50.0 µs/
151.4762400 µs
T
770 mV

Acquisition is stopped.
2.00 GSa/s 4.10 Mpts

Figure 36 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.

Saved: 05 JUL 2004 13:24:19

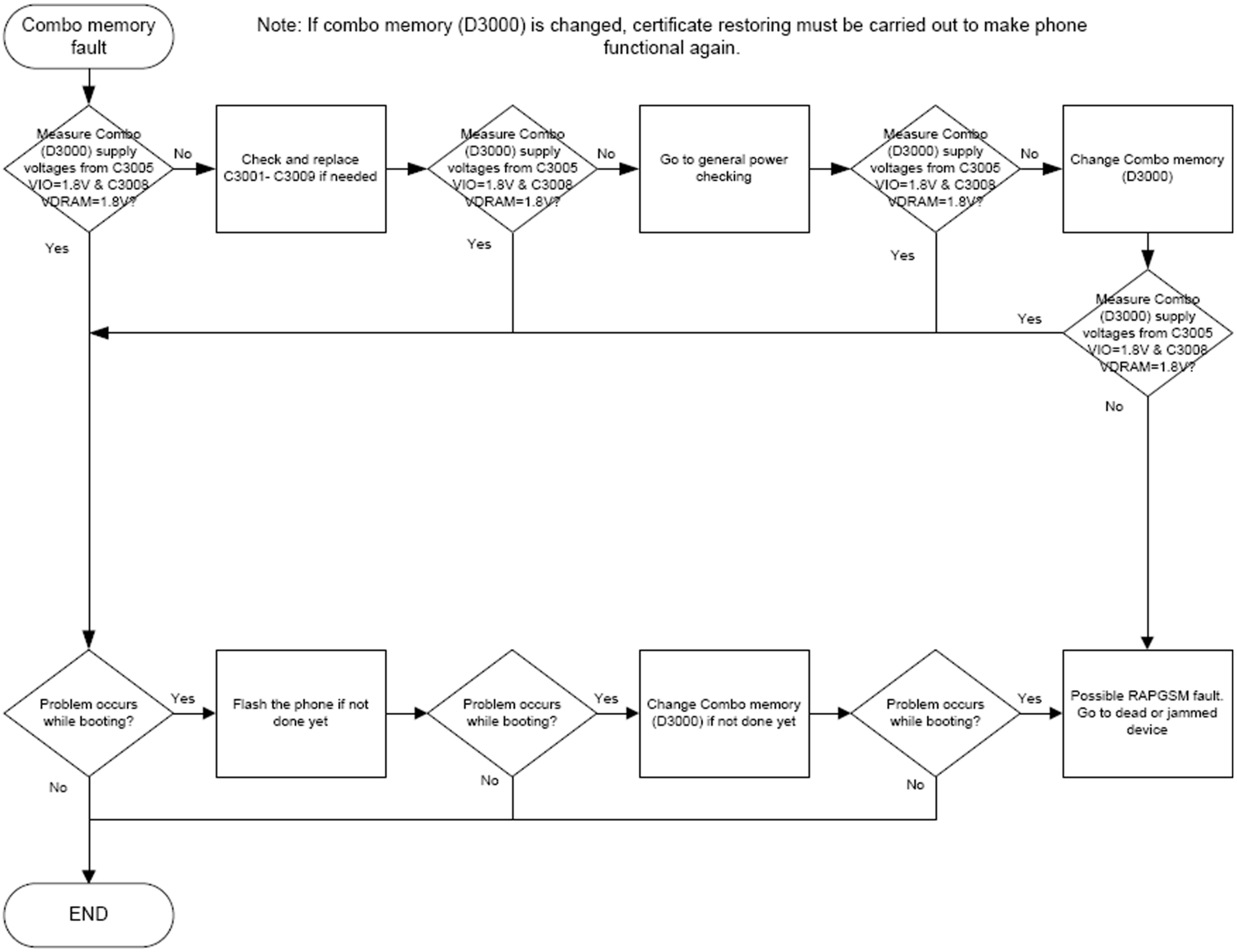

File
Control
Setup
Measure
Analyze
Utilities
Help
1:24 P
On
1.00 V/
1.00 V/
When flashing has started
BSI
PURX
More (1of 2)
Clear All
H
100 µs/
228.6069240 µs
T
1.040 V

Acquisition is stopped.
2.00 GSa/s 8.20 Mpts

Figure 37 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

COMBO memory troubleshooting

Troubleshooting flow


Combo memory fault
Note: If combo memory (D3000) is changed, certificate restoring must be carried out to make phone functional again.
Measure Combo (D3000) supply voltages from C3005 VIO=1.8V & C3008 VDRAM=1.8V?
No
Yes
Check and replace C3001- C3009 if needed
Go to general power checking
Change Combo memory (D3000)
Problem occurs while booting?
Flash the phone if not done yet
Change Combo memory (D3000) if not done yet
Possible RAPGSM fault. Go to dead or jammed device
END

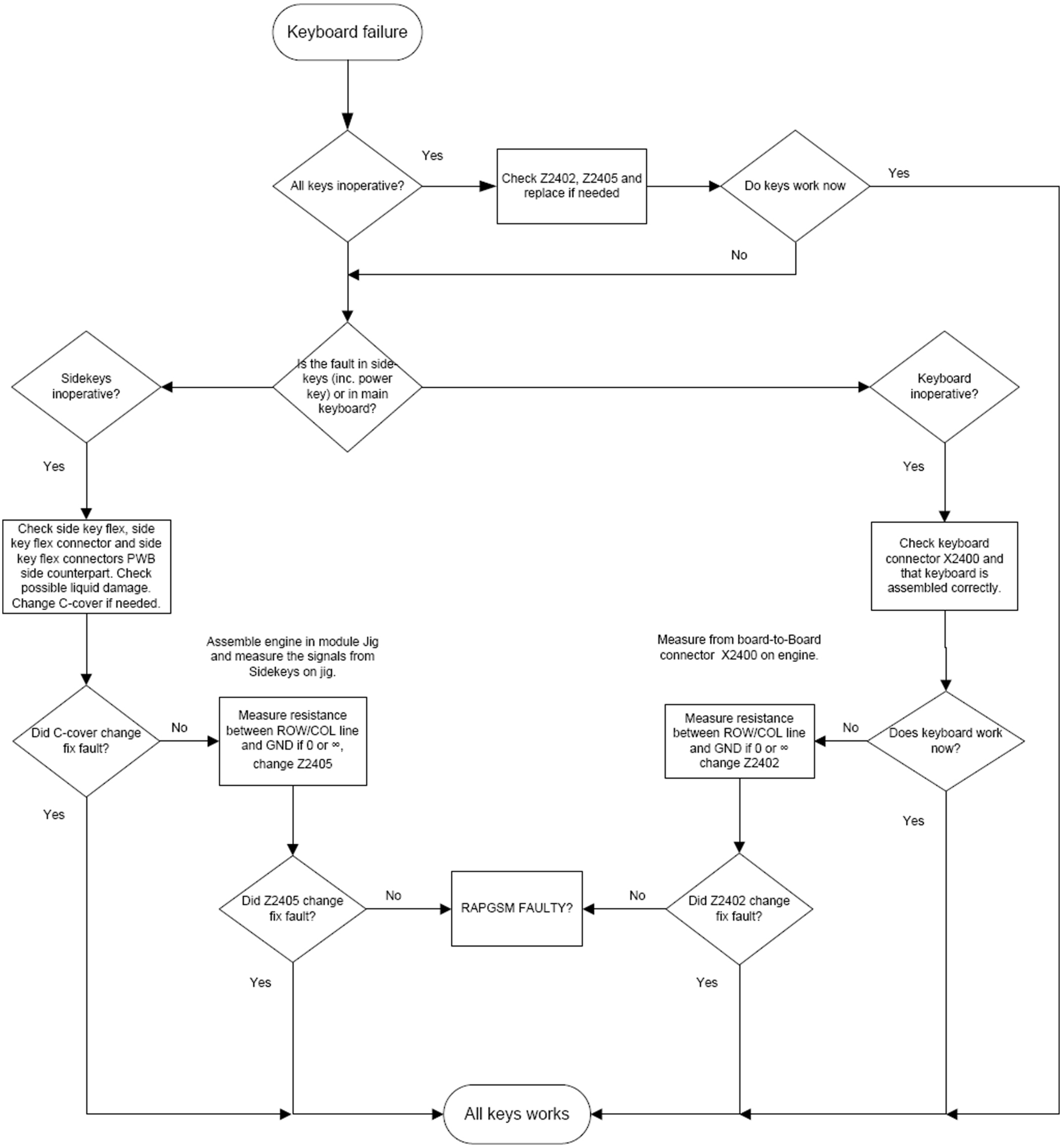
Keyboard troubleshooting

Context

There are two possible failure modes in the keyboard module: a) One or more keys can be stuck, so that the key does not react when a keydome is pressed. This kind of failure is caused by mechanical reasons (dirt, rust), b) Malfunction of several keys at the same time; this happens when one or more rows or columns are failing (shortcut or open connection).

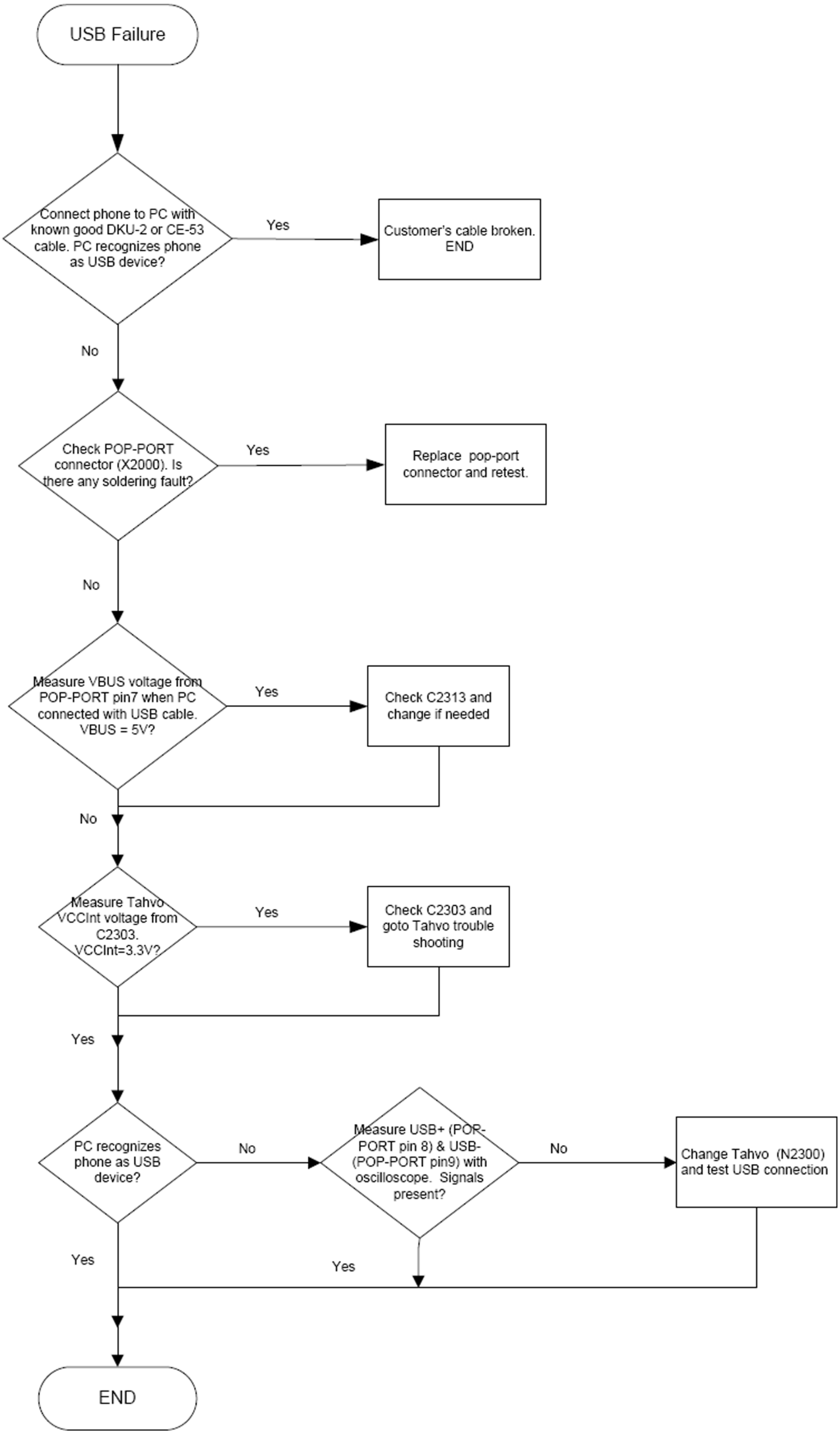
For a more detailed description of the keyboard and keymatrix, see section Keyboard. If the failure mode is not clear, start with the Keyboard Test in Phoenix.

Troubleshooting flow


Keyboard failure
All keys inoperative?
Yes
Check Z2402, Z2405 and replace if needed
Do keys work now
Yes
No
Is the fault in side-keys (inc. power key) or in main keyboard?
Sidekeys inoperative?
Keyboard inoperative?
Yes
Yes
Check side key flex, side key flex connector and side key flex connectors PWB side counterpart. Check possible liquid damage. Change C-cover if needed.
Check keyboard connector X2400 and that keyboard is assembled correctly.
Assemble engine in module Jig and measure the signals from Sidekeys on jig.
Measure from board-to-Board connector X2400 on engine.
Did C-cover change fix fault?
No
Measure resistance between ROW/COL line and GND if 0 or ∞, change Z2405
Measure resistance between ROW/COL line and GND if 0 or ∞ change Z2402
No
Does keyboard work now?
Yes
Yes
Did Z2405 change fix fault?
No
RAPGSM FAULTY?
No
Did Z2402 change fix fault?
Yes
Yes
All keys works

USB troubleshooting

Troubleshooting flow


USB Failure
Connect phone to PC with known good DKU-2 or CE-53 cable. PC recognizes phone as USB device?
Yes
Customer's cable broken. END
No
Check POP-PORT connector (X2000). Is there any soldering fault?
Yes
Replace pop-port connector and retest.
No
Measure VBUS voltage from POP-PORT pin7 when PC connected with USB cable. VBUS = 5V?
Yes
Check C2313 and change if needed
No
Measure Tahvo VCCInt voltage from C2303. VCCInt=3.3V?
Yes
Check C2303 and goto Tahvo trouble shooting
Yes
PC recognizes phone as USB device?
No
Measure USB+ (POP-PORT pin 8) & USB- (POP-PORT pin9) with oscilloscope. Signals present?
No
Change Tahvo (N2300) and test USB connection
Yes
Yes
END

Backup battery troubleshooting

Verify that the backup battery is empty (U<1V). Measure voltage of the battery when the main battery is connected to the phone and the phone is switched on.

Wait a few minutes and monitor that the backup battery voltage is rised. Switch off the phone and disconnect the main battery and monitor that voltage of backup battery is filled. Normal behaviour of the voltage is described pictures.

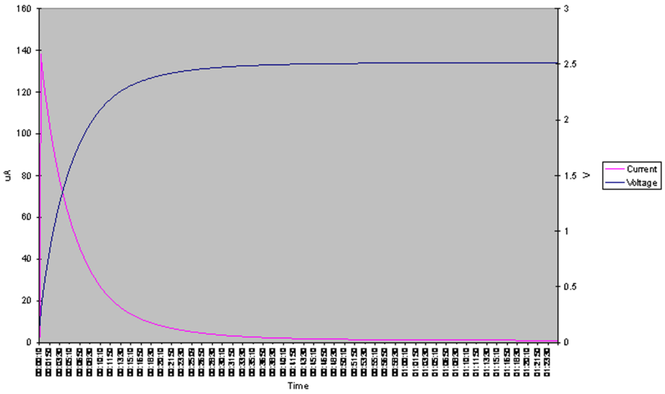


Figure 38 Charging backup battery

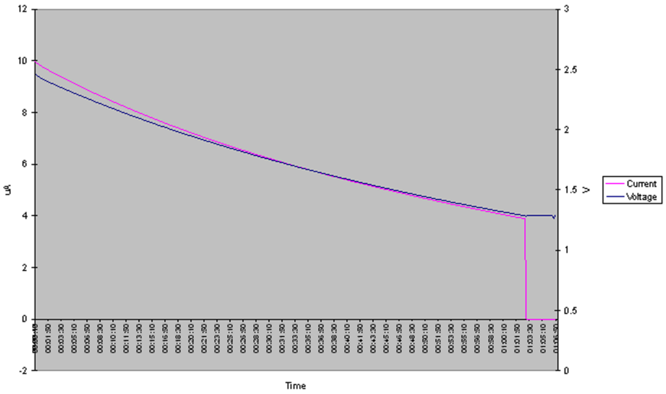
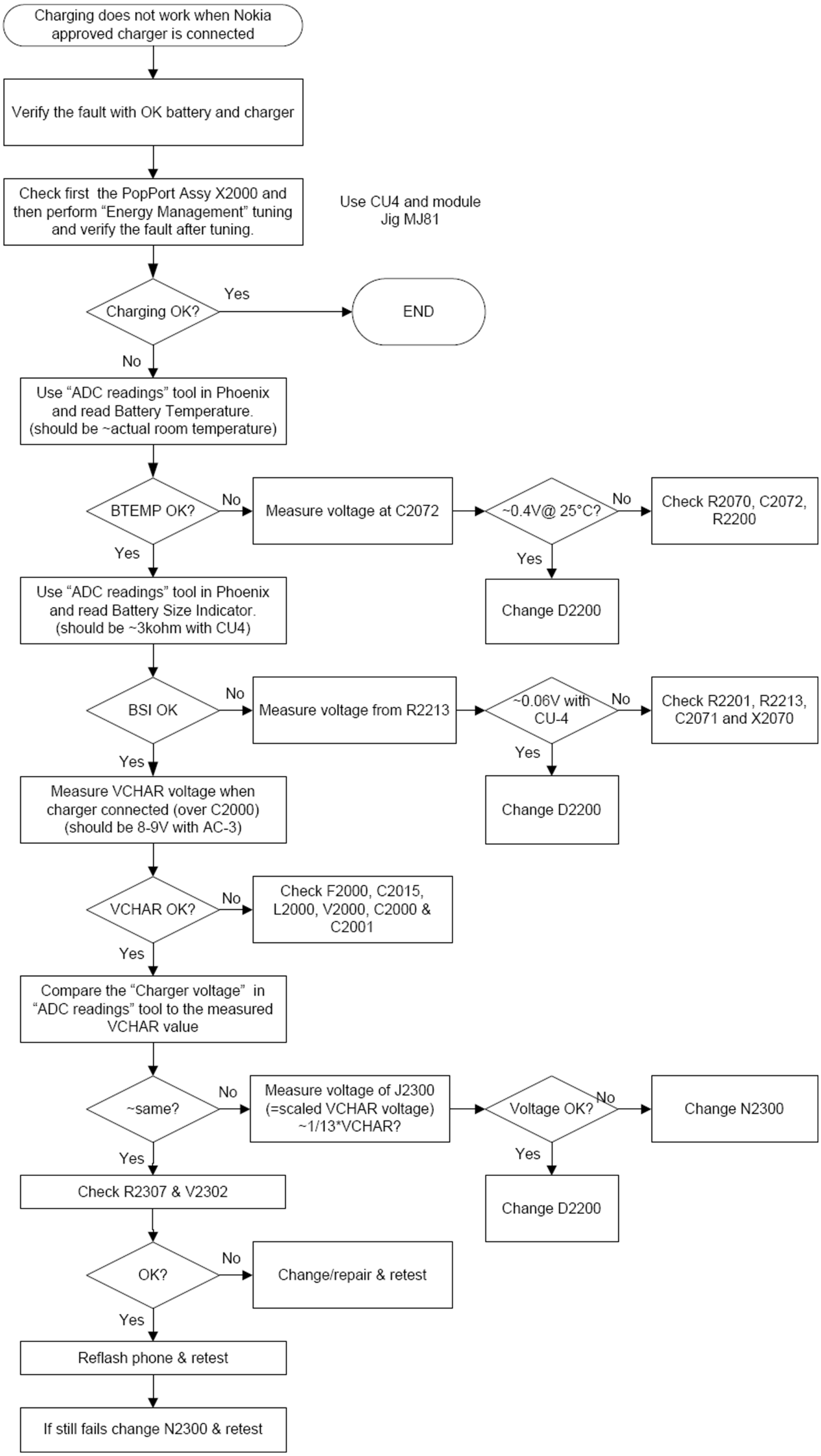


Figure 39 Discharging backup battery

If the voltage rises and falls quickly, battery is dead. If the voltage stays 0V, check resistance VBACK<-> GND: If there is no short circuit, Retu is faulty. Replace Retu.

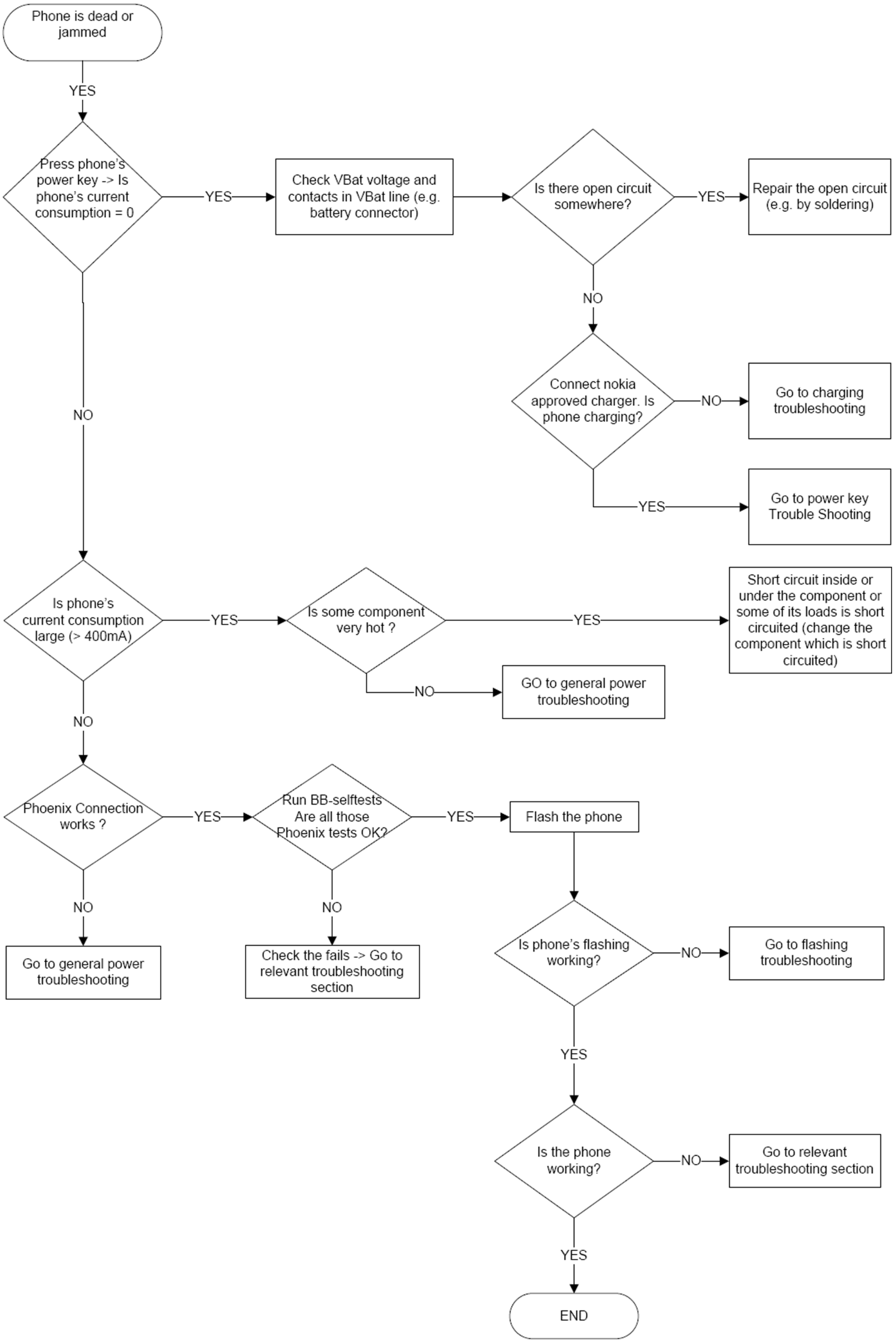
Charging troubleshooting

Troubleshooting flow


Charging does not work when Nokia approved charger is connected
Verify the fault with OK battery and charger
Check first the PopPort Assy X2000 and then perform "Energy Management" tuning and verify the fault after tuning.
Use CU4 and module Jig MJ81
Charging OK?
Yes
END
No
Use "ADC readings" tool in Phoenix and read Battery Temperature. (should be ~actual room temperature)
BTEMP OK?
No
Measure voltage at C2072
~0.4V@ 25°C?
No
Check R2070, C2072, R2200
Yes
Change D2200
Yes
Use "ADC readings" tool in Phoenix and read Battery Size Indicator. (should be ~3kohm with CU4)
BSI OK
No
Measure voltage from R2213
~0.06V with CU-4
No
Check R2201, R2213, C2071 and X2070
Yes
Change D2200
Yes
Measure VCHAR voltage when charger connected (over C2000) (should be 8-9V with AC-3)
VCHAR OK?
No
Check F2000, C2015, L2000, V2000, C2000 & C2001
Yes
Compare the "Charger voltage" in "ADC readings" tool to the measured VCHAR value
~same?
No
Measure voltage of J2300 (=scaled VCHAR voltage) ~1/13*VCHAR?
Voltage OK?
No
Change N2300
Yes
Change D2200
Yes
Check R2307 & V2302
OK?
No
Change/repair & retest
Yes
Reflash phone & retest
If still fails change N2300 & retest

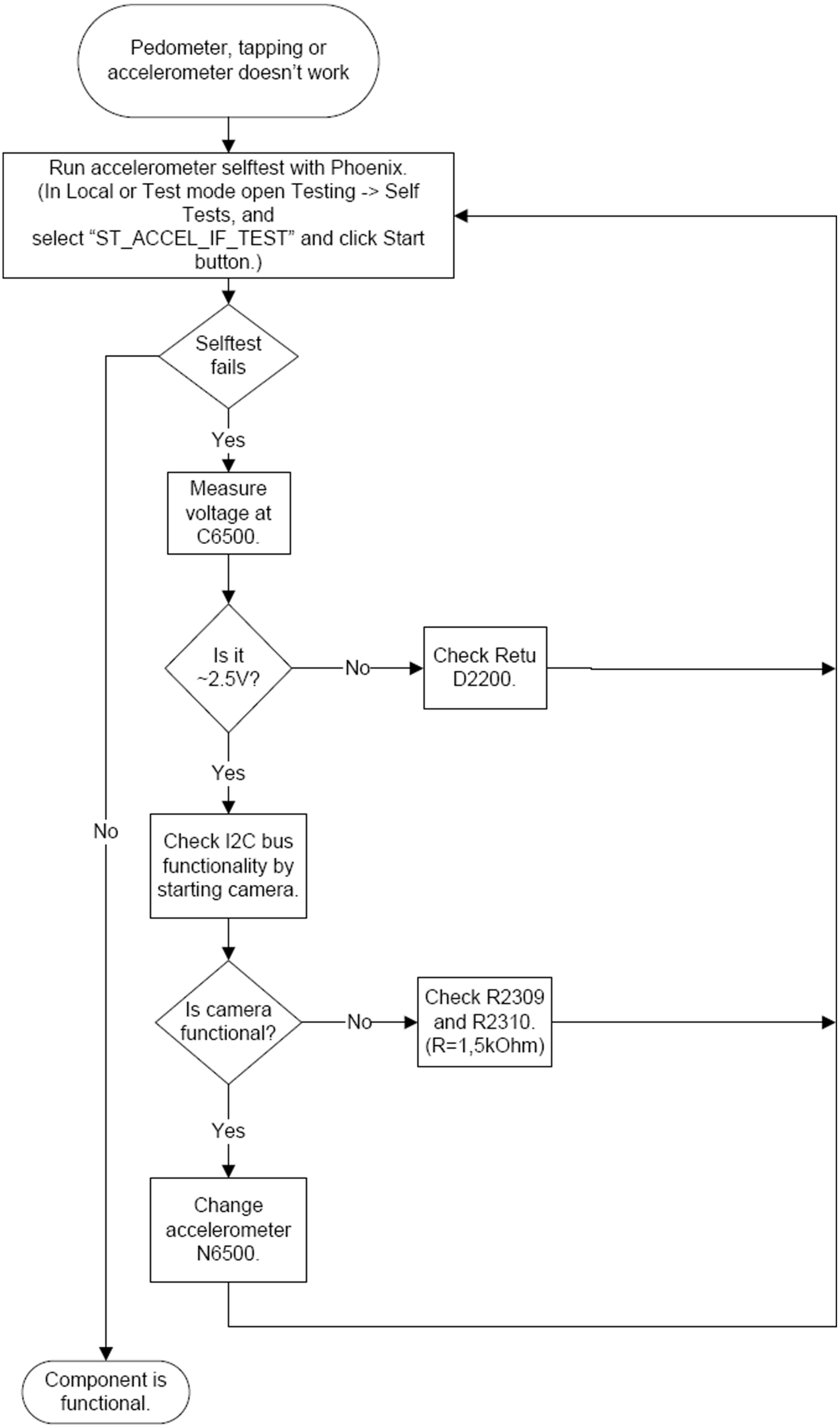
Dead or jammed troubleshooting

Troubleshooting flow


Phone is dead or jammed
YES
Press phone's power key -> Is phone's current consumption = 0
YES
Check VBat voltage and contacts in VBat line (e.g. battery connector)
Is there open circuit somewhere?
YES
Repair the open circuit (e.g. by soldering)
NO
Connect nokia approved charger. Is phone charging?
NO
Go to charging troubleshooting
YES
Go to power key Trouble Shooting
NO
Is phone's current consumption large (> 400mA)
YES
Is some component very hot ?
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
GO to general power troubleshooting
NO
Phoenix Connection works ?
YES
Run BB-selftests Are all those Phoenix tests OK?
YES
Flash the phone
NO
Go to general power troubleshooting
NO
Check the fails -> Go to relevant troubleshooting section
Is phone's flashing working?
NO
Go to flashing troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
END

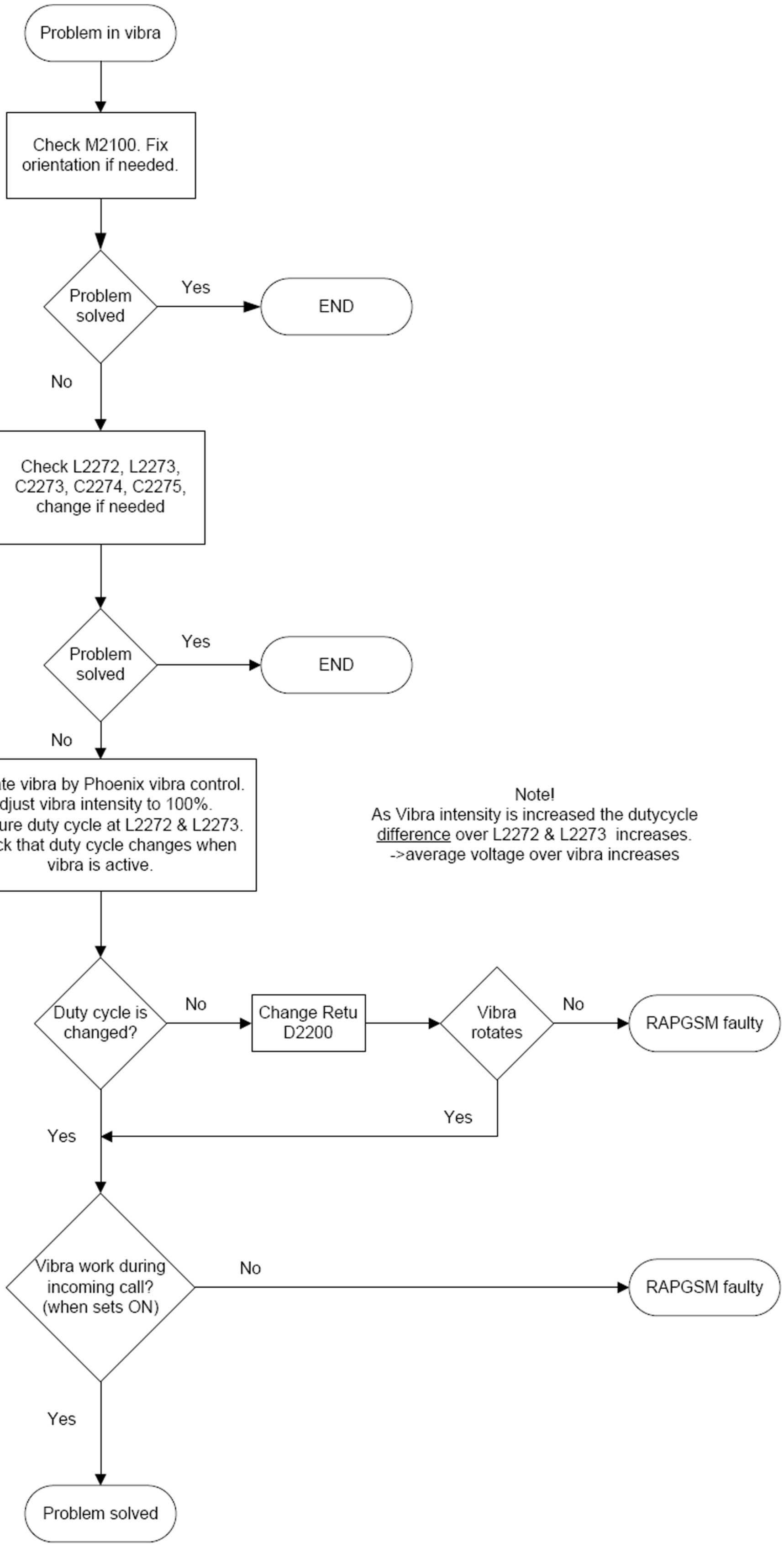
Accelerometer troubleshooting

Troubleshooting flow


Pedometer, tapping or accelerometer doesn’t work
Run accelerometer selftest with Phoenix. (In Local or Test mode open Testing -> Self Tests, and select “ST_ACCEL_IF_TEST” and click Start button.)
Selftest fails
Yes
No
Measure voltage at C6500.
Is it ~2.5V?
No
Check Retu D2200.
Yes
Check I2C bus functionality by starting camera.
Is camera functional?
No
Check R2309 and R2310. (R=1,5kOhm)
Yes
Change accelerometer N6500.
Component is functional.

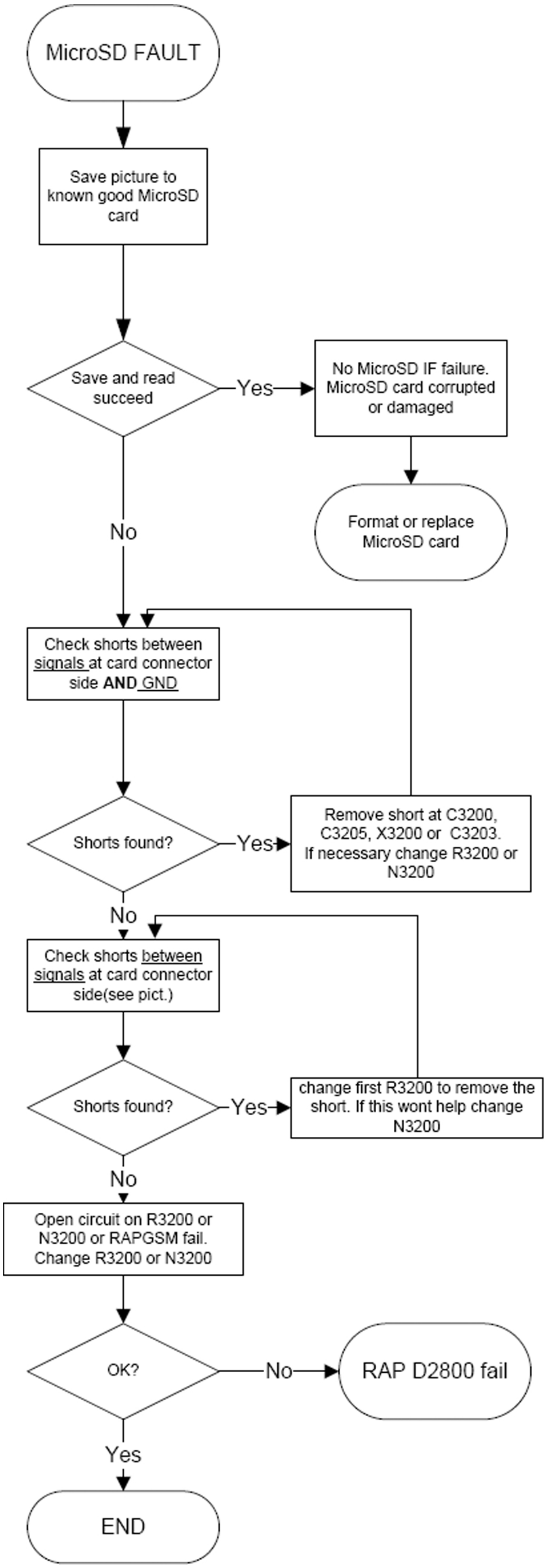
Vibra troubleshooting

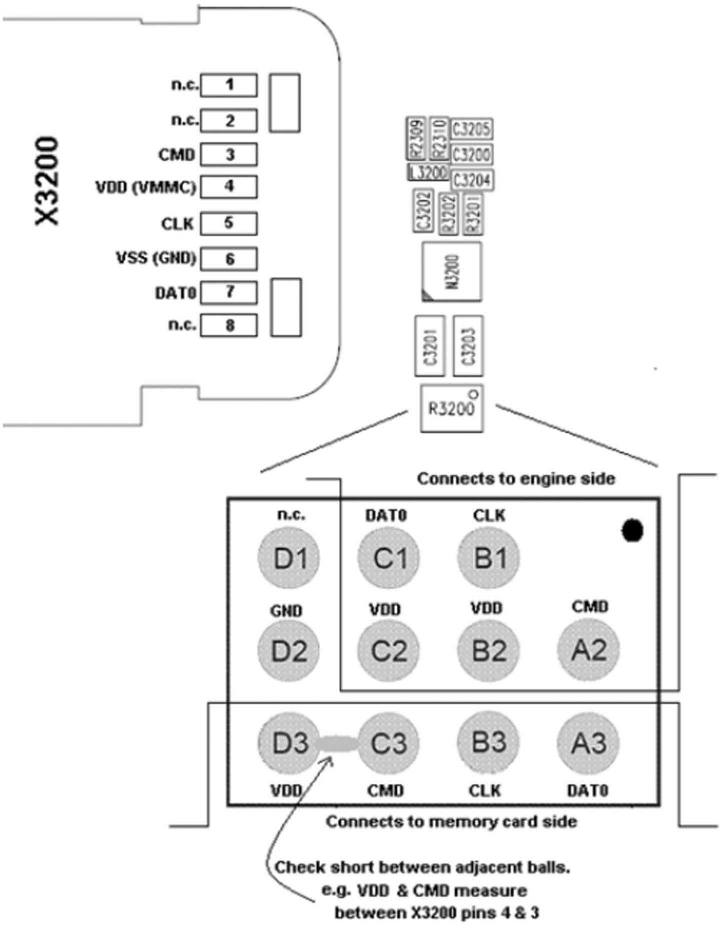
Troubleshooting flow


Problem in vibra
Check M2100. Fix orientation if needed.
Problem solved
Yes
END
No
Check L2272, L2273, C2273, C2274, C2275, change if needed
Problem solved
Yes
END
No
Activate vibra by Phoenix vibra control. Adjust vibra intensity to 100%. Measure duty cycle at L2272 & L2273. Check that duty cycle changes when vibra is active.
Note! As Vibra intensity is increased the dutycycle difference over L2272 & L2273 increases. ->average voltage over vibra increases
Duty cycle is changed?
No
Change Retu D2200
Vibra rotates
No
RAPGSM faulty
Yes
Yes
Vibra work during incoming call? (when sets ON)
No
RAPGSM faulty
Yes
Problem solved

MicroSD troubleshooting

Troubleshooting flow

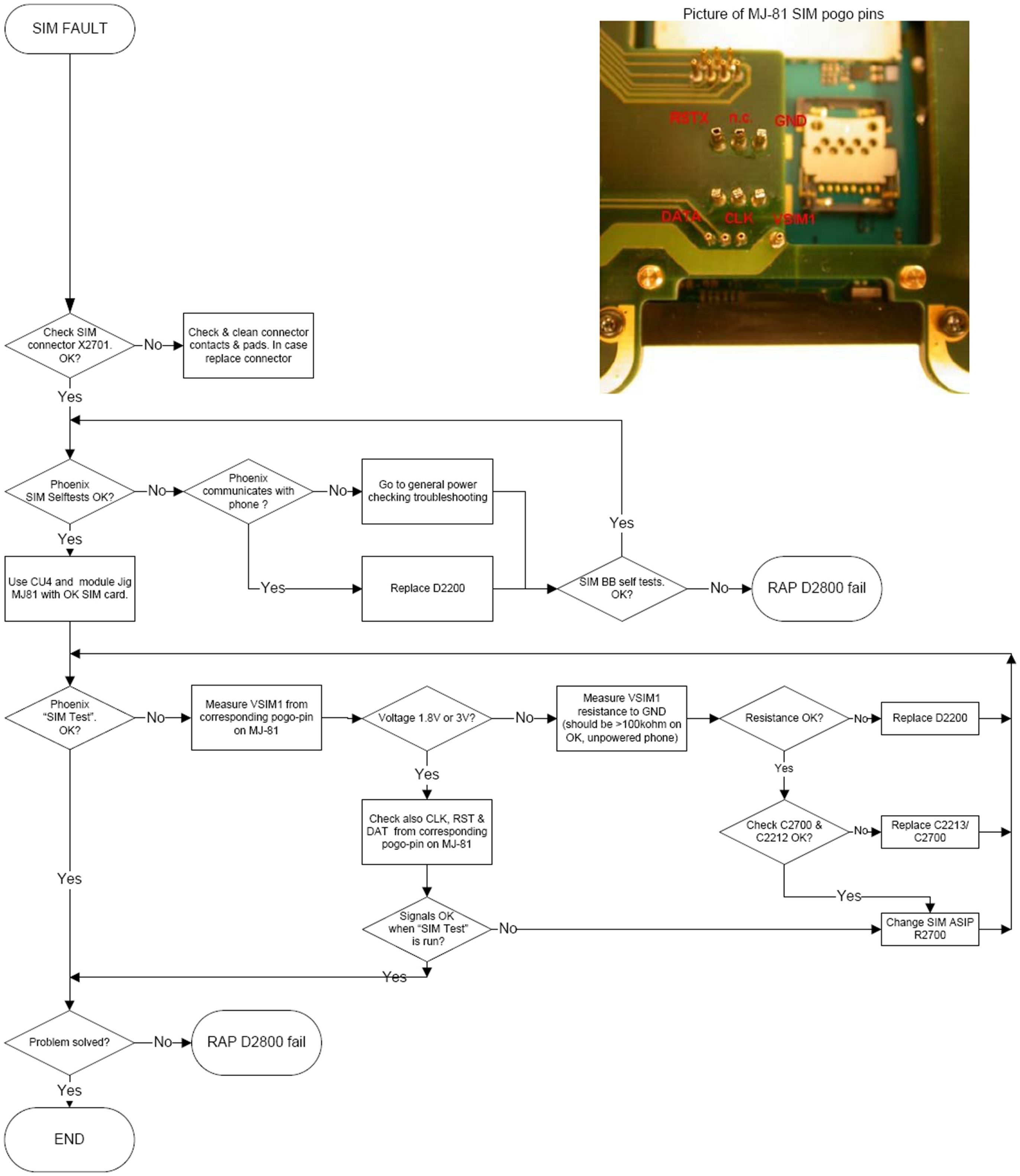

MicroSD FAULT
Save picture to known good MicroSD card
Save and read succeed
Yes
No MicroSD IF failure. MicroSD card corrupted or damaged
Format or replace MicroSD card
No
Check shorts between signals at card connector side AND GND
Shorts found?
Yes
Remove short at C3200, C3205, X3200 or C3203. If necessary change R3200 or N3200
No
Check shorts between signals at card connector side(see pict.)
Shorts found?
Yes
change first R3200 to remove the short. If this wont help change N3200
No
Open circuit on R3200 or N3200 or RAPGSM fail. Change R3200 or N3200
OK?
No
RAP D2800 fail
Yes
END


X3200
n.c. 1
n.c. 2
CMD 3
VDD (VMMC) 4
CLK 5
VSS (GND) 6
DAT0 7
n.c. 8
R2309
R2310
C3205
C3200
L3200
C3204
C3202
R3202
R3201
N3200
C3201
C3203
R3200
Connects to engine side
n.c.
D1
DAT0
C1
CLK
B1
GND
D2
VDD
C2
VDD
B2
CMD
A2
D3
C3
B3
A3
VDD
CMD
CLK
DAT0
Connects to memory card side
Check short between adjacent balls.
e.g. VDD & CMD measure
between X3200 pins 4 & 3

Note!
Always close & lock the MicroSD reader door before attaching the phone to service tools. Attaching the phone to service tools without closing the MicroSD reader may damage the phone.

SIM troubleshooting

Troubleshooting flow


Picture of MJ-81 SIM pogo pins
RSTX
n.c.
GND
DATA
CLK
VSIM1
SIM FAULT
Check SIM connector X2701. OK?
No
Check & clean connector contacts & pads. In case replace connector
Yes
Phoenix SIM Selftests OK?
No
Phoenix communicates with phone ?
No
Go to general power checking troubleshooting
Yes
Replace D2200
Yes
Use CU4 and module Jig MJ81 with OK SIM card.
SIM BB self tests. OK?
Yes
No
RAP D2800 fail
Phoenix "SIM Test". OK?
No
Measure VSIM1 from corresponding pogo-pin on MJ-81
Voltage 1.8V or 3V?
No
Measure VSIM1 resistance to GND (should be >100kohm on OK, unpowered phone)
Resistance OK?
No
Replace D2200
Yes
Yes
Check also CLK, RST & DAT from corresponding pogo-pin on MJ-81
Check C2700 & C2212 OK?
No
Replace C2213/ C2700
Yes
Yes
Signals OK when "SIM Test" is run?
No
Change SIM ASIP R2700
Yes
Problem solved?
No
RAP D2800 fail
Yes
END

Display module troubleshooting

General instructions for display troubleshooting

The first step is to verify with a working display that the fault is not on the display module itself. The display module cannot be repaired.

The second step is to check that the cellular engine is working normally. This can be done by connecting the phone to a docking station and starting Phoenix service software. With the help of Phoenix read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

After these checks proceed to the display troubleshooting flowcharts. Use the Display Test tool in Phoenix to find the detailed fault mode.

Operating modes of the display

The display is in a normal mode when the phone is in active use.

The display is in a partial idle mode when the phone is in the screen saver mode.

The operating modes of the display can be controlled with the help of Phoenix.

Table 7 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), but the backlight is not, follow the Display and Keyboard Backlight troubleshooting.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

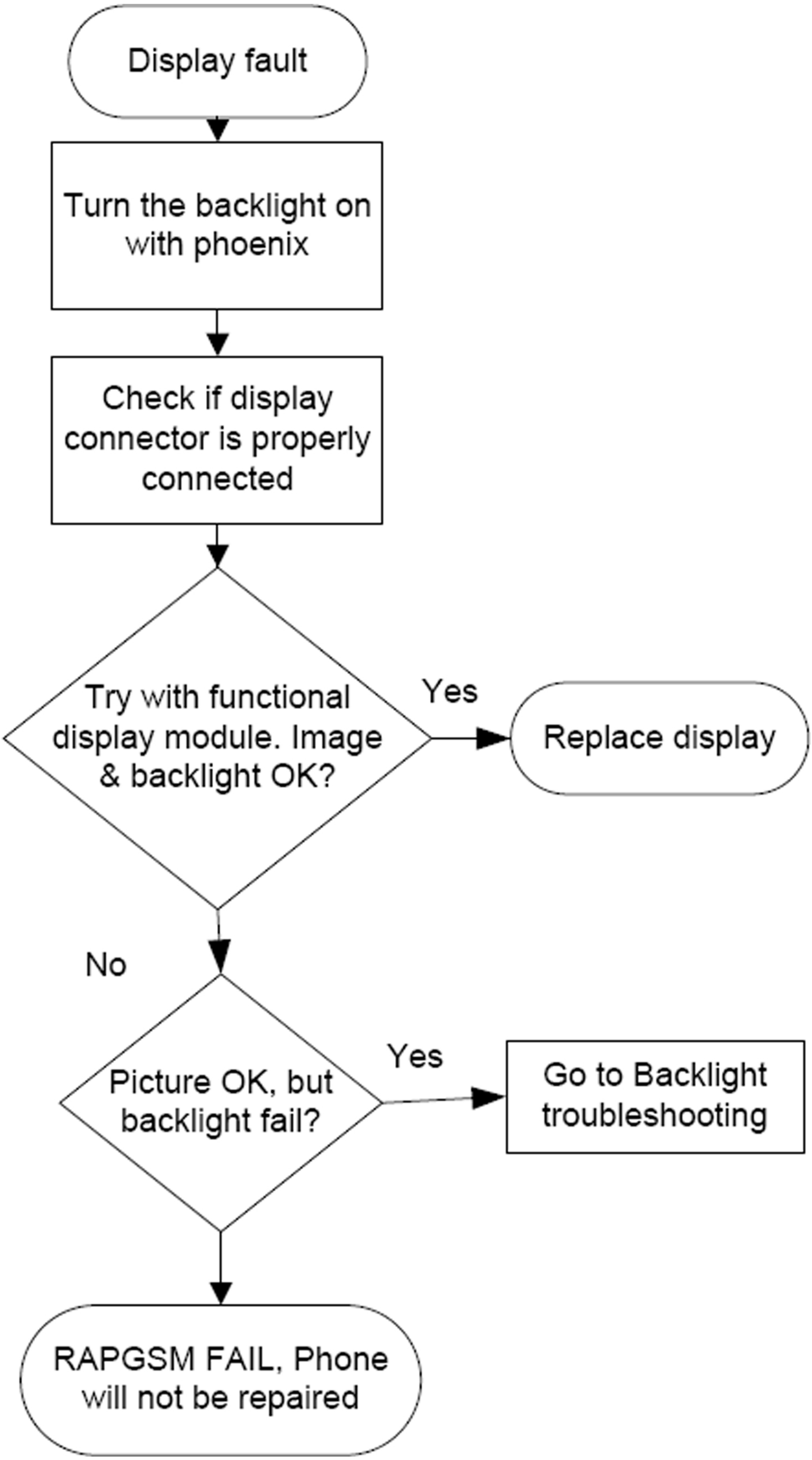
Table 8 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Note: Blinking pixels are not allowed in normal operating temperatures and light conditions.

Display fault troubleshooting

Troubleshooting flow

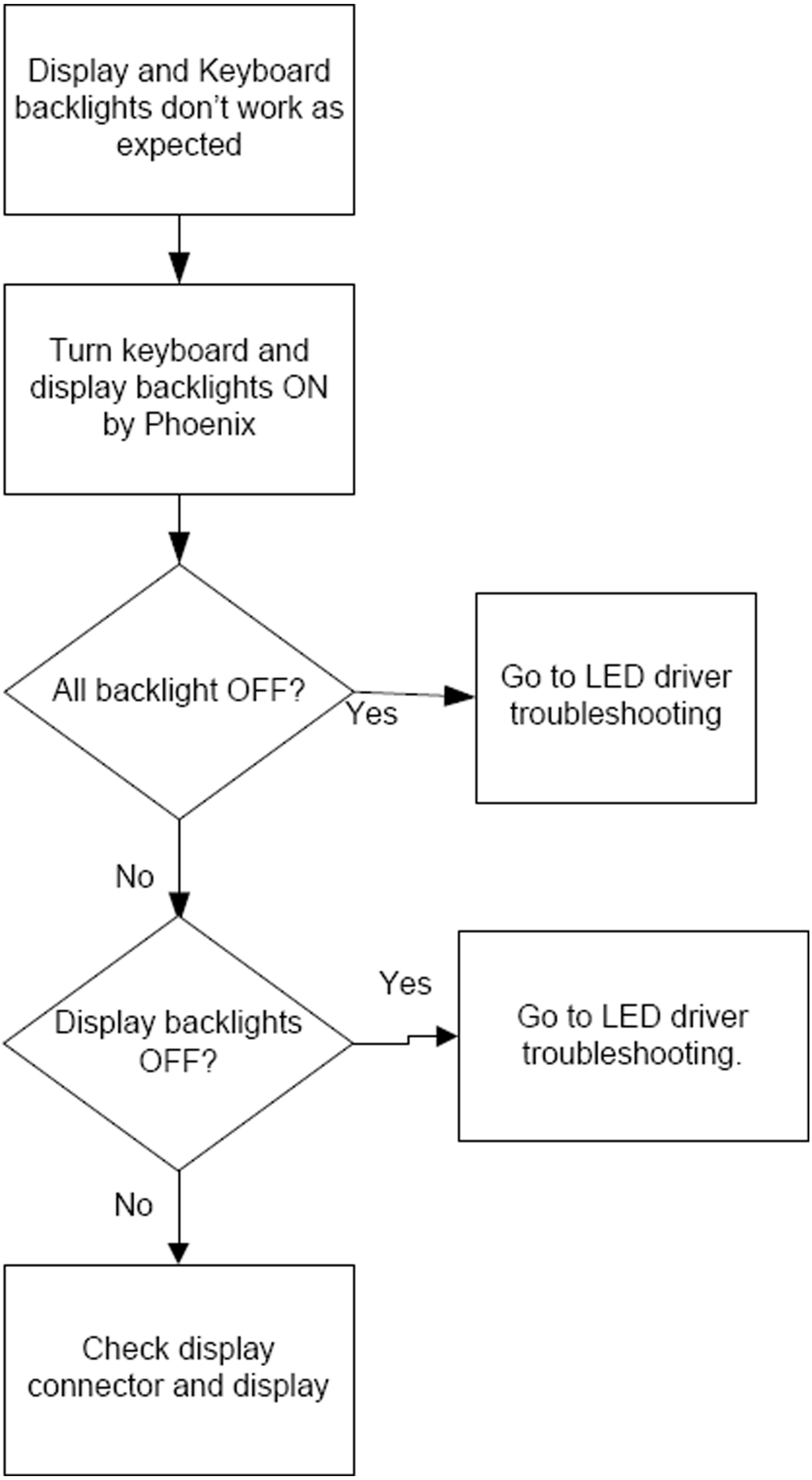

Display fault
Turn the backlight on with phoenix
Check if display connector is properly connected
Try with functional display module. Image & backlight OK?
Yes
Replace display
No
Picture OK, but backlight fail?
Yes
Go to Backlight troubleshooting
RAPGSM FAIL, Phone will not be repaired

Display and keyboard backlight troubleshooting

Context

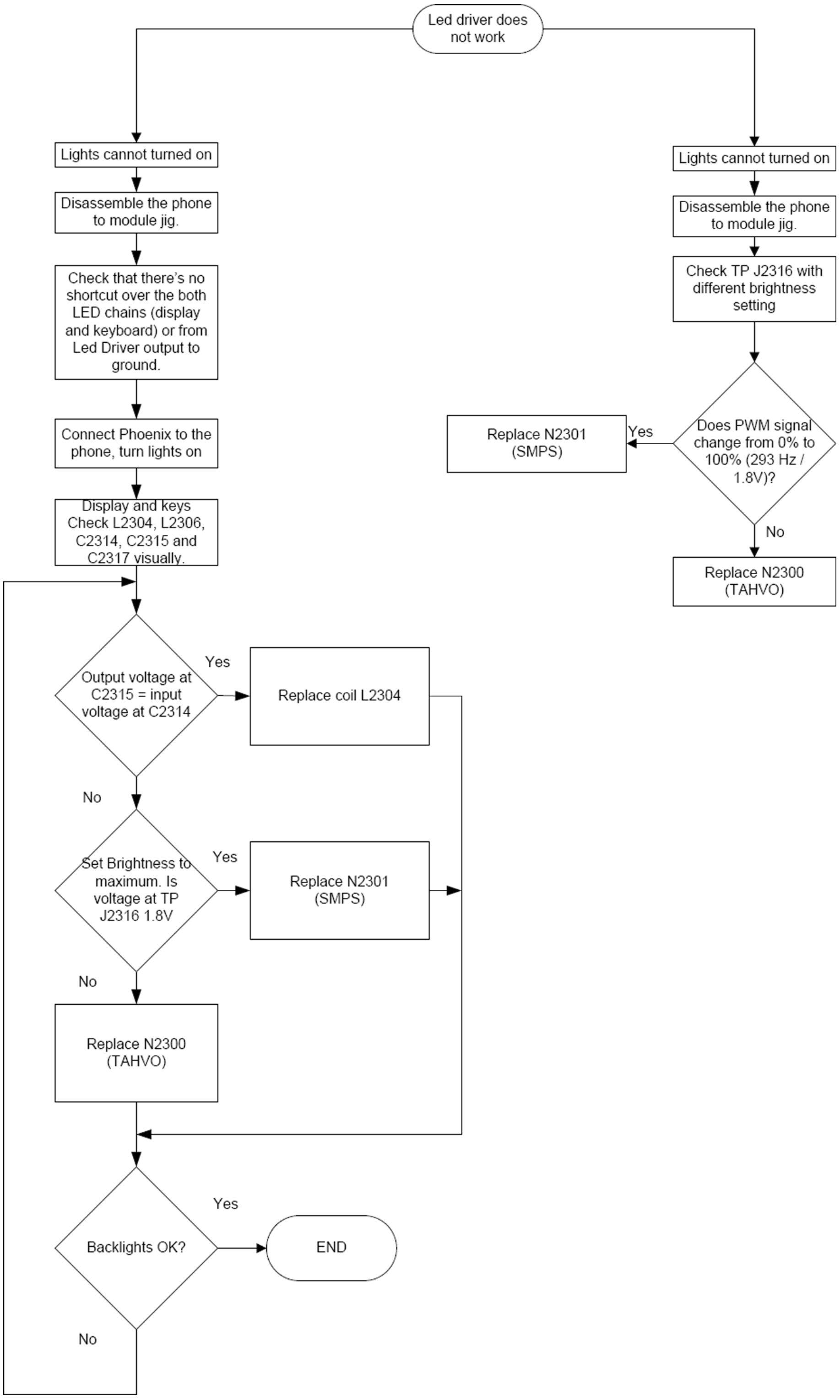
The device has one LED driver that provides current for display and keyboard backlights. Backlight brightness can be adjusted manually by Phoenix.

Troubleshooting flow


Display and Keyboard backlights don't work as expected
Turn keyboard and display backlights ON by Phoenix
All backlight OFF?
Yes
Go to LED driver troubleshooting
No
Display backlights OFF?
Yes
Go to LED driver troubleshooting.
No
Check display connector and display

LED driver troubleshooting

Troubleshooting flow


Led driver does not work
Lights cannot turned on
Disassemble the phone to module jig.
Check that there's no shortcut over the both LED chains (display and keyboard) or from Led Driver output to ground.
Connect Phoenix to the phone, turn lights on
Display and keys Check L2304, L2306, C2314, C2315 and C2317 visually.
Output voltage at C2315 = input voltage at C2314
Yes
Replace coil L2304
No
Set Brightness to maximum. Is voltage at TP J2316 1.8V
Yes
Replace N2301 (SMPS)
No
Replace N2300 (TAHVO)
Backlights OK?
Yes
END
No
Lights cannot turned on
Disassemble the phone to module jig.
Check TP J2316 with different brightness setting
Does PWM signal change from 0% to 100% (293 Hz / 1.8V)?
Yes
Replace N2301 (SMPS)
No
Replace N2300 (TAHVO)

Bluetooth and FM radio troubleshooting

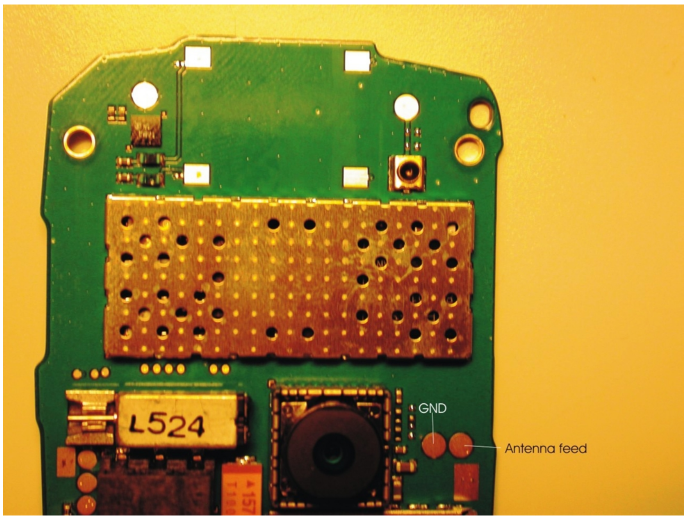
Introduction to Bluetooth/FM Radio troubleshooting

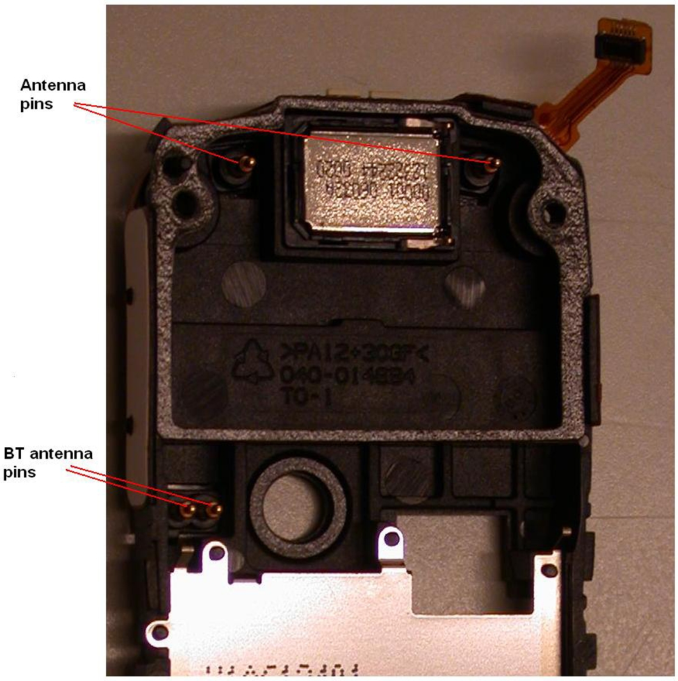
There are two main Bluetooth problems that can occur:

Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see next page for details about BT antenna HW and Mechanics)
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

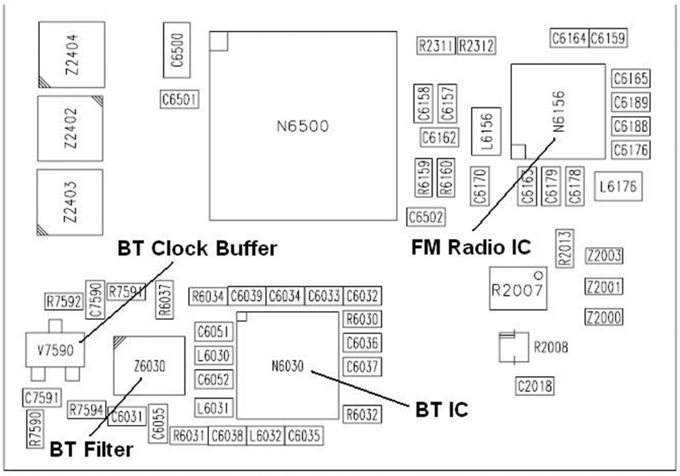
The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

Location of the BT antenna




Antenna pins
BT antenna pins

Bluetooth/FM Radio layout


Z2404
Z2402
Z2403
C6500
C6501
N6500
R2311
R2312
C6164
C6159
C6165
C6189
C6188
C6176
N6156
C6158
C6157
C6162
L6156
R6159
R6160
C6170
C6163
C6179
C6178
L6176
C6502
BT Clock Buffer
FM Radio IC
R2013
Z2003
Z2001
Z2000
R2007
R2008
C2018
R7592
C7590
R7591
R6037
R6034
C6039
C6034
C6033
C6032
R6030
C6051
L6030
C6052
C6036
C6037
V7590
Z6030
N6030
C7591
R7594
C6031
C6055
L6031
R6032
BT IC
R7590
BT Filter
R6031
C6038
L6032
C6035

Bluetooth settings for Phoenix

Steps

1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Place the phone to a flash adapter in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate JBT-9's serial number (12 digits) found in the type label on the back of JBT-9.

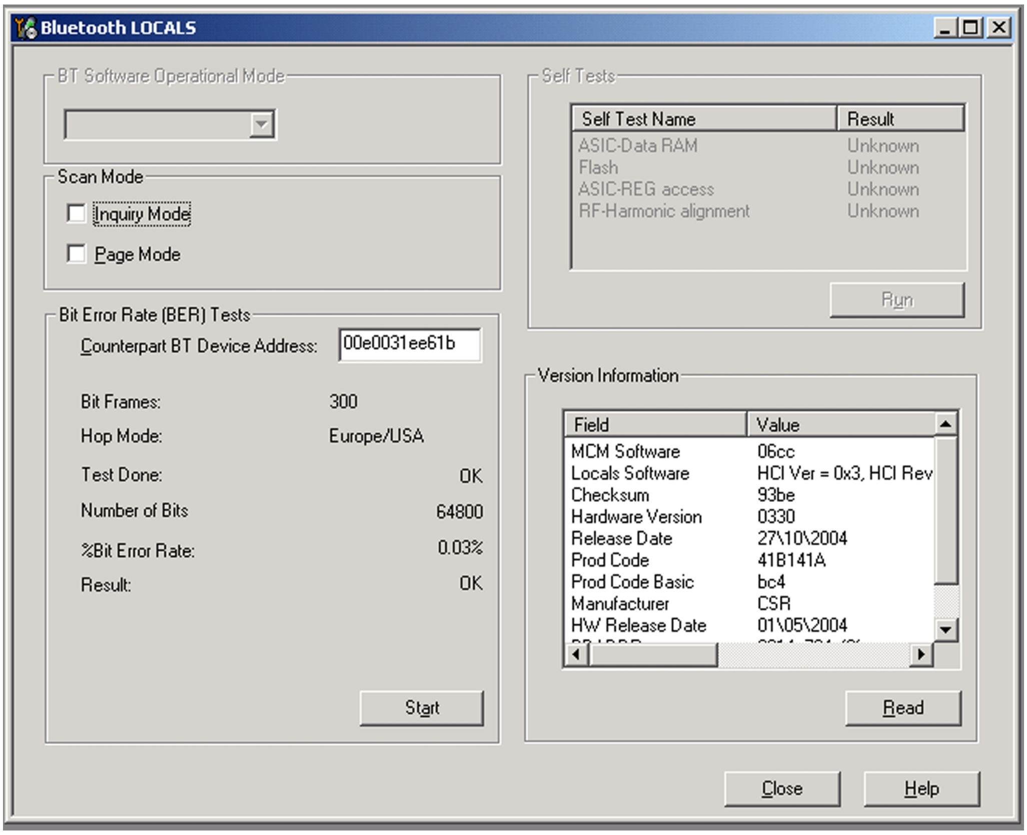
   In addition to JBT-9, also SB-6, JBT-3 and JBT-6 Bluetooth test boxes can be used.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the **Counterpart BT Device Address** line.

This needs to be done only once provided that JBT-9 is not changed.

7. Place the JBT-9 box near (within 10 cm) the BT antenna and click **Run BER Test**.

Results

Bit Error Rate test result is displayed in the *Bit Error Rate (BER) Tests* pane in the *Bluetooth LOCALS* window.


Bluetooth LOCALS
BT Software Operational Mode
Scan Mode
☐ Inquiry Mode
☐ Page Mode
Start
Self Tests
Run
Version Information
Read
Close
Help

Bit Error Rate (BER) Tests

Counterpart BT Device Address: 00e0031ee61b

Bit Frames: 300

Hop Mode: Europe/USA

Test Done: OK

Number of Bits: 64800

%Bit Error Rate: 0.03%

Result: OK

Self Test Name	Result
ASIC-Data RAM	Unknown
Flash	Unknown
ASIC-REG access	Unknown
RF-Harmonic alignment	Unknown

Field	Value
MCM Software	06cc
Locals Software	HCI Ver = 0x3, HCI Rev
Checksum	93be
Hardware Version	0330
Release Date	27\10\2004
Prod Code	41B141A
Prod Code Basic	bc4
Manufacturer	CSR
HW Release Date	01\05\2004

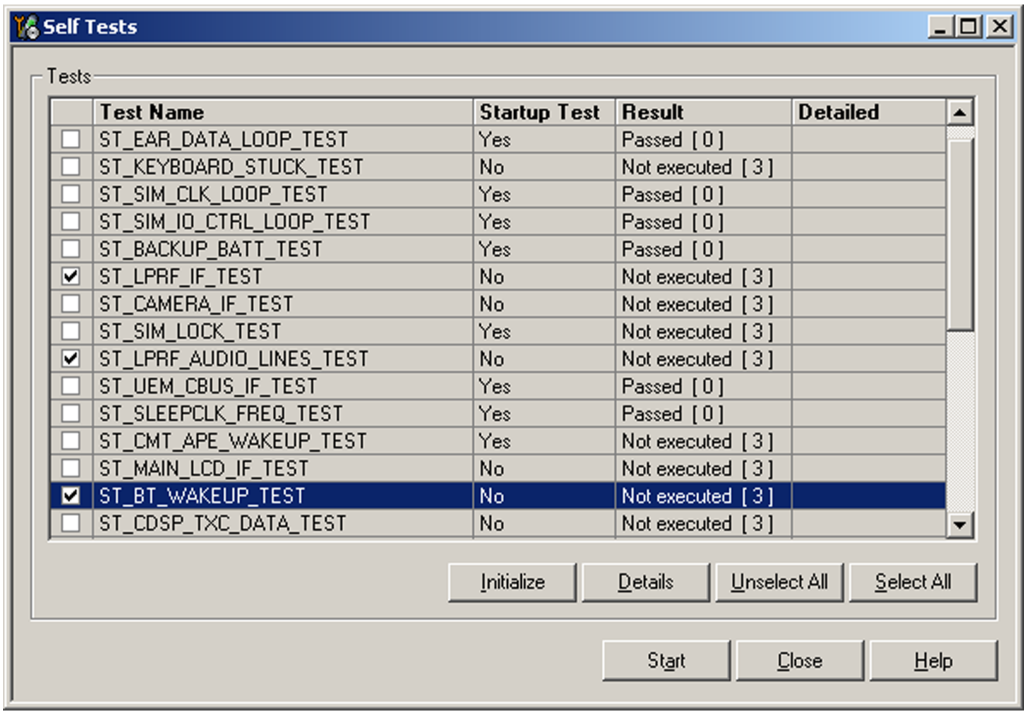
Figure 40 BER test result

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. Choose**File→Scan Product.**
3. Place the phone to a flash adapter.
4. From the **Mode** drop-down menu, set mode to **Local**.
5. Choose **Testing→Self Tests.**
6. In the *Self Tests* window check the following Bluetooth related tests:
    - **ST_LPRF_IF_TEST**
    - **ST_LPRF_AUDIO_LINES_TEST**
    - **ST_BT_WAKEUP_TEST**

7. To run the tests, click **Start**.

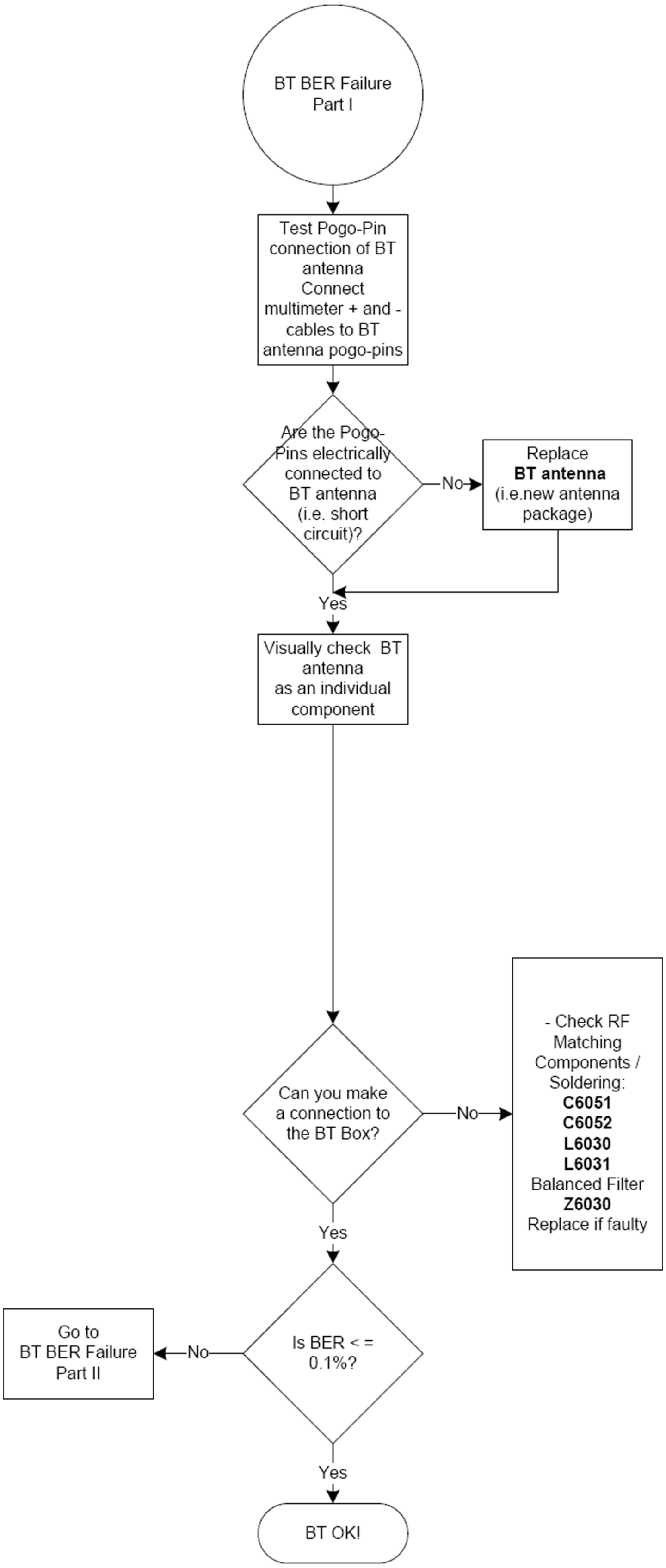


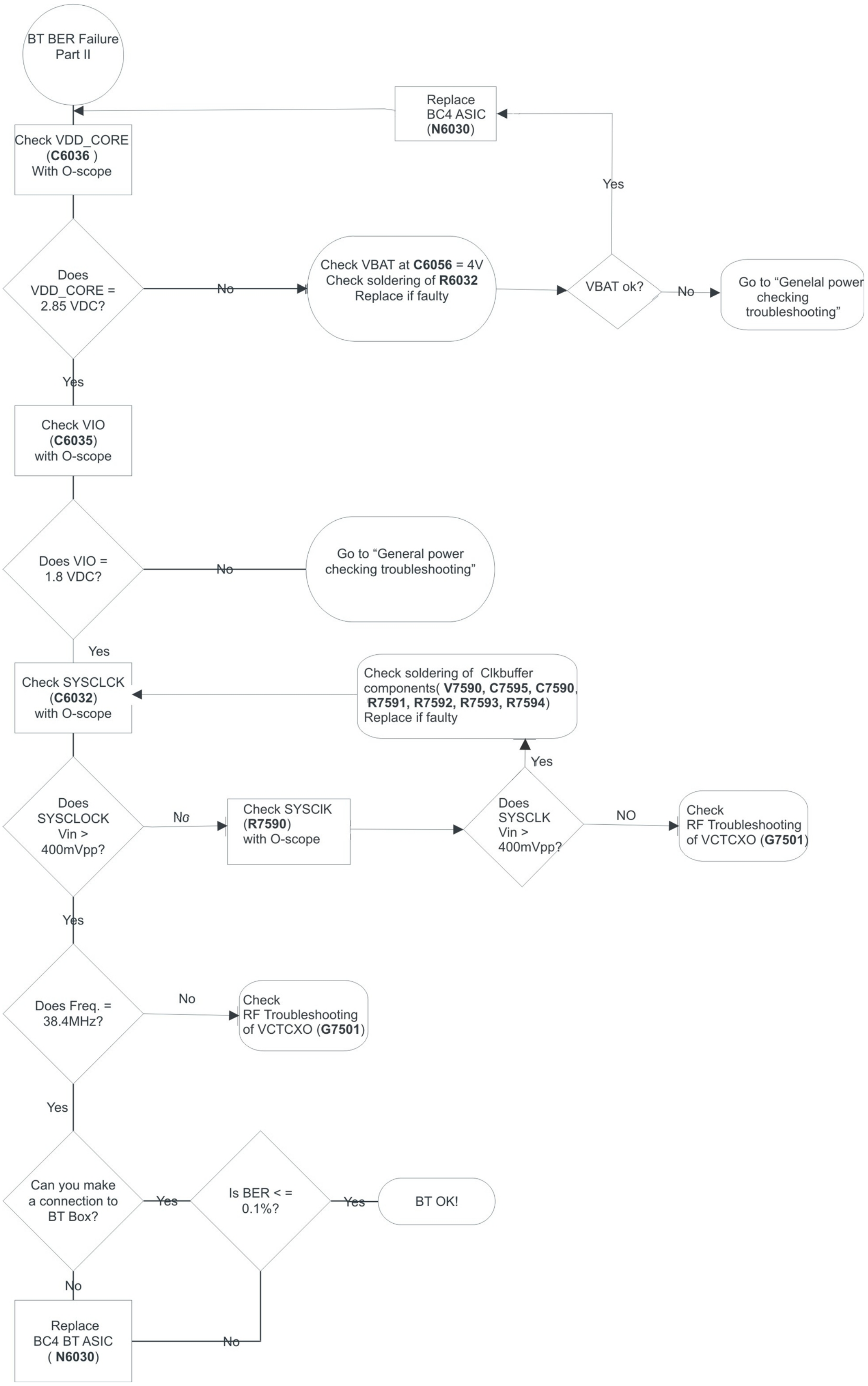
	Test Name	Startup Test	Result	Detailed
☐	ST_EAR_DATA_LOOP_TEST	Yes	Passed [0]	
☐	ST_KEYBOARD_STUCK_TEST	No	Not executed [3]	
☐	ST_SIM_CLK_LOOP_TEST	Yes	Passed [0]	
☐	ST_SIM_IO_CTRL_LOOP_TEST	Yes	Passed [0]	
☐	ST_BACKUP_BATT_TEST	Yes	Passed [0]	
☑	ST_LPRF_IF_TEST	No	Not executed [3]	
☐	ST_CAMERA_IF_TEST	No	Not executed [3]	
☐	ST_SIM_LOCK_TEST	Yes	Not executed [3]	
☑	ST_LPRF_AUDIO_LINES_TEST	No	Not executed [3]	
☐	ST_UEM_CBUS_IF_TEST	Yes	Passed [0]	
☐	ST_SLEEPCLK_FREQ_TEST	Yes	Passed [0]	
☐	ST_CMT_APE_WAKEUP_TEST	Yes	Not executed [3]	
☐	ST_MAIN_LCD_IF_TEST	No	Not executed [3]	
☑	ST_BT_WAKEUP_TEST	No	Not executed [3]	
☐	ST_CDSP_TXC_DATA_TEST	No	Not executed [3]	

Figure 41 Bluetooth self tests in *Phoenix*

Bluetooth BER failure troubleshooting

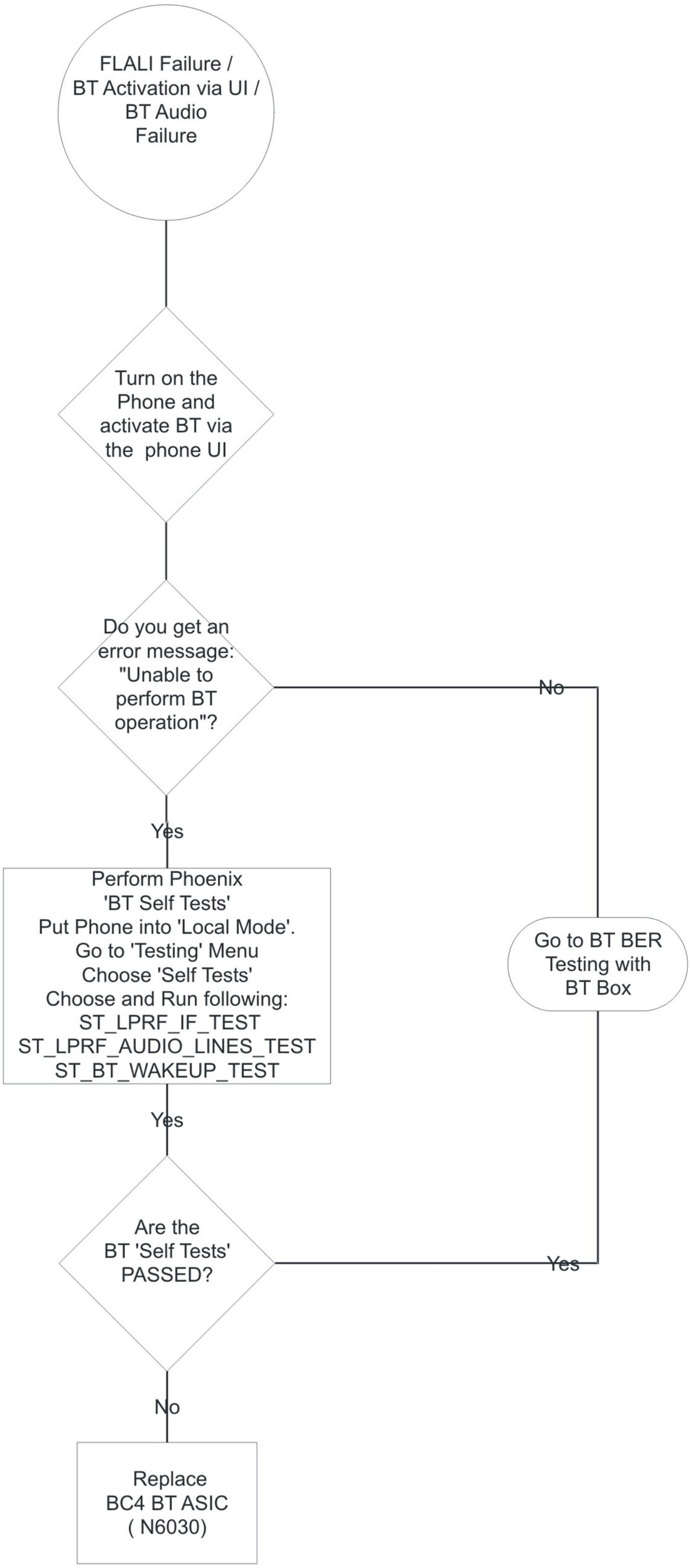
Troubleshooting flow


BT BER Failure Part I
Test Pogo-Pin connection of BT antenna Connect multimeter + and - cables to BT antenna pogo-pins
Are the Pogo-Pins electrically connected to BT antenna (i.e. short circuit)?
No
Replace **BT antenna** (i.e.new antenna package)
Yes
Visually check BT antenna as an individual component
Can you make a connection to the BT Box?
No
- Check RF Matching Components / Soldering: **C6051** **C6052** **L6030** **L6031** Balanced Filter **Z6030** Replace if faulty
Yes
Is BER < = 0.1%?
No
Go to BT BER Failure Part II
Yes
BT OK!


BT BER Failure Part II
Replace BC4 ASIC (N6030)
Check VDD_CORE (C6036) With O-scope
Yes
Does VDD_CORE = 2.85 VDC?
No
Check VBAT at C6056 = 4V Check soldering of R6032 Replace if faulty
VBAT ok?
No
Go to "Genelal power checking troubleshooting"
Yes
Check VIO (C6035) with O-scope
Does VIO = 1.8 VDC?
No
Go to "General power checking troubleshooting"
Yes
Check SYSCLCK (C6032) with O-scope
Check soldering of Clkbuffer components(V7590, C7595, C7590, R7591, R7592, R7593, R7594) Replace if faulty
Yes
Does SYSCLOCK Vin > 400mVpp?
No
Check SYSCIK (R7590) with O-scope
Does SYSCLK Vin > 400mVpp?
NO
Check RF Troubleshooting of VCTCXO (G7501)
Yes
Does Freq. = 38.4MHz?
No
Check RF Troubleshooting of VCTCXO (G7501)
Yes
Can you make a connection to BT Box?
Yes
Is BER < = 0.1%?
Yes
BT OK!
No
Replace BC4 BT ASIC (N6030)
No

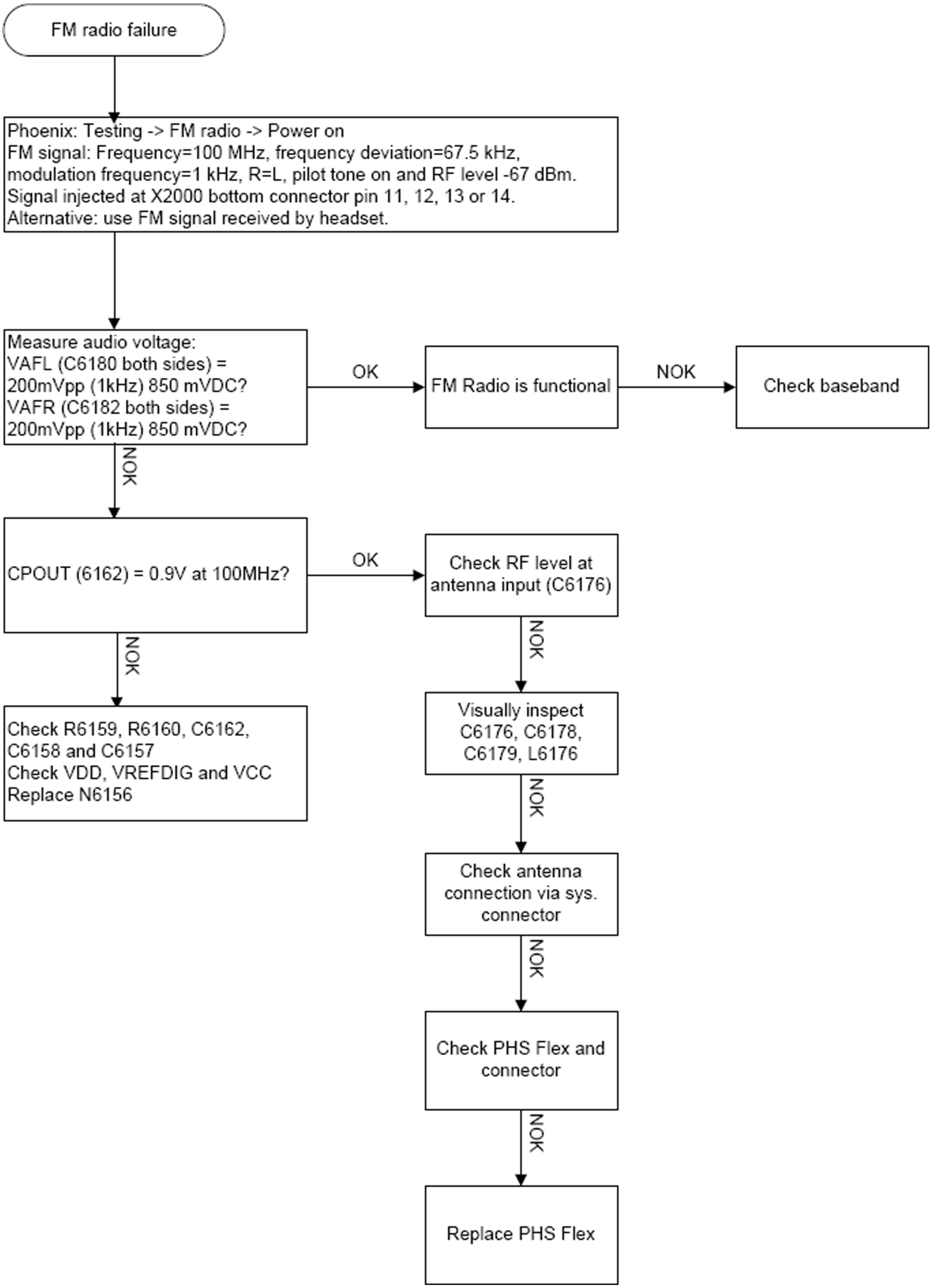
BT audio failure troubleshooting

Troubleshooting flow


FLALI Failure / BT Activation via UI / BT Audio Failure
Turn on the Phone and activate BT via the phone UI
Do you get an error message: "Unable to perform BT operation"?
No
Yes
Perform Phoenix 'BT Self Tests'
Put Phone into 'Local Mode'.
Go to 'Testing' Menu
Choose 'Self Tests'
Choose and Run following:
ST_LPRF_IF_TEST
ST_LPRF_AUDIO_LINES_TEST
ST_BT_WAKEUP_TEST
Go to BT BER Testing with BT Box
Yes
Are the BT 'Self Tests' PASSED?
Yes
No
Replace BC4 BT ASIC (N6030)

FM Radio troubleshooting

Troubleshooting flow


FM radio failure
Phoenix: Testing -> FM radio -> Power on
FM signal: Frequency=100 MHz, frequency deviation=67.5 kHz,
modulation frequency=1 kHz, R=L, pilot tone on and RF level -67 dBm.
Signal injected at X2000 bottom connector pin 11, 12, 13 or 14.
Alternative: use FM signal received by headset.
Measure audio voltage:
VAFL (C6180 both sides) =
200mVpp (1kHz) 850 mVDC?
VAFR (C6182 both sides) =
200mVpp (1kHz) 850 mVDC?
OK
FM Radio is functional
NOK
Check baseband
NOK
CPOUT (6162) = 0.9V at 100MHz?
OK
Check RF level at
antenna input (C6176)
NOK
NOK
Check R6159, R6160, C6162,
C6158 and C6157
Check VDD, VREFDIG and VCC
Replace N6156
Visually inspect
C6176, C6178,
C6179, L6176
NOK
Check antenna
connection via sys.
connector
NOK
Check PHS Flex and
connector
NOK
Replace PHS Flex

Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- Current probe (Internal handsfree PWM output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

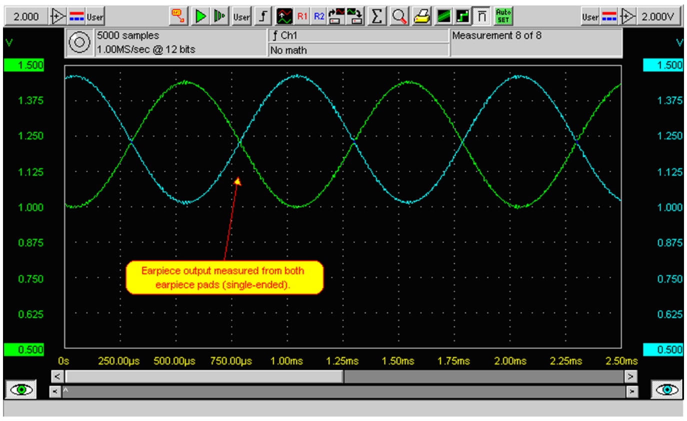
The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	J2100 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	B2101 pads					
Internal Mic to External Earpiece	B2100 (OUT/ GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data

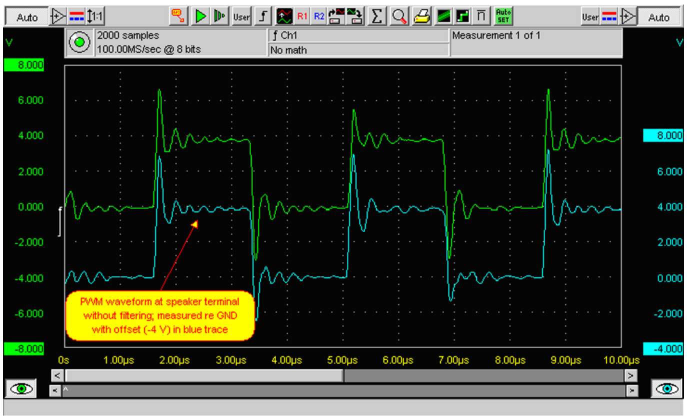


5000 samples
1.00MS/sec @ 12 bits
ƒ Ch1
No math
Measurement 8 of 8

Earpiece output measured from both earpiece pads (single-ended).

2.000
User
User
2.000V
V
1.500
1.375
1.250
1.125
1.000
0.875
0.750
0.625
0.500
0s
250.00µs
500.00µs
750.00µs
1.00ms
1.25ms
1.50ms
1.75ms
2.00ms
2.25ms
2.50ms

Figure 42 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.

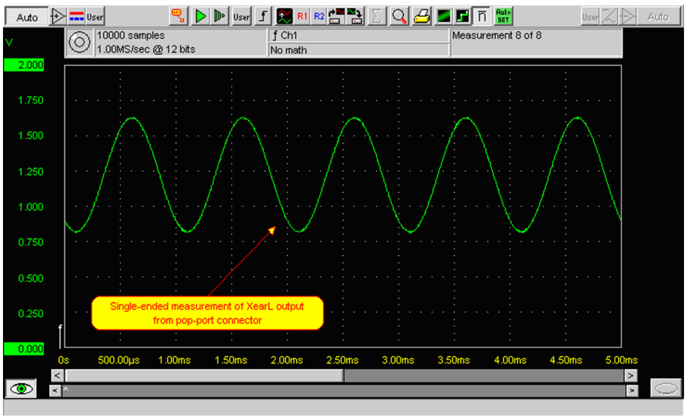


2000 samples
100.00MS/sec @ 8 bits
ƒ Ch1
No math
Measurement 1 of 1

PWM waveform at speaker terminal without filtering; measured re GND with offset (-4 V) in blue trace

Auto
1:1
User
Auto
V
8.000
6.000
4.000
2.000
0.000
-2.000
-4.000
-6.000
-8.000
8.000
6.000
4.000
2.000
0.000
-2.000
-4.000
0s
1.00µs
2.00µs
3.00µs
4.00µs
5.00µs
6.00µs
7.00µs
8.00µs
9.00µs
10.00µs

Figure 43 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.



10000 samples
1.00MS/sec @ 12 bits
ƒ Ch1
No math
Measurement 8 of 8

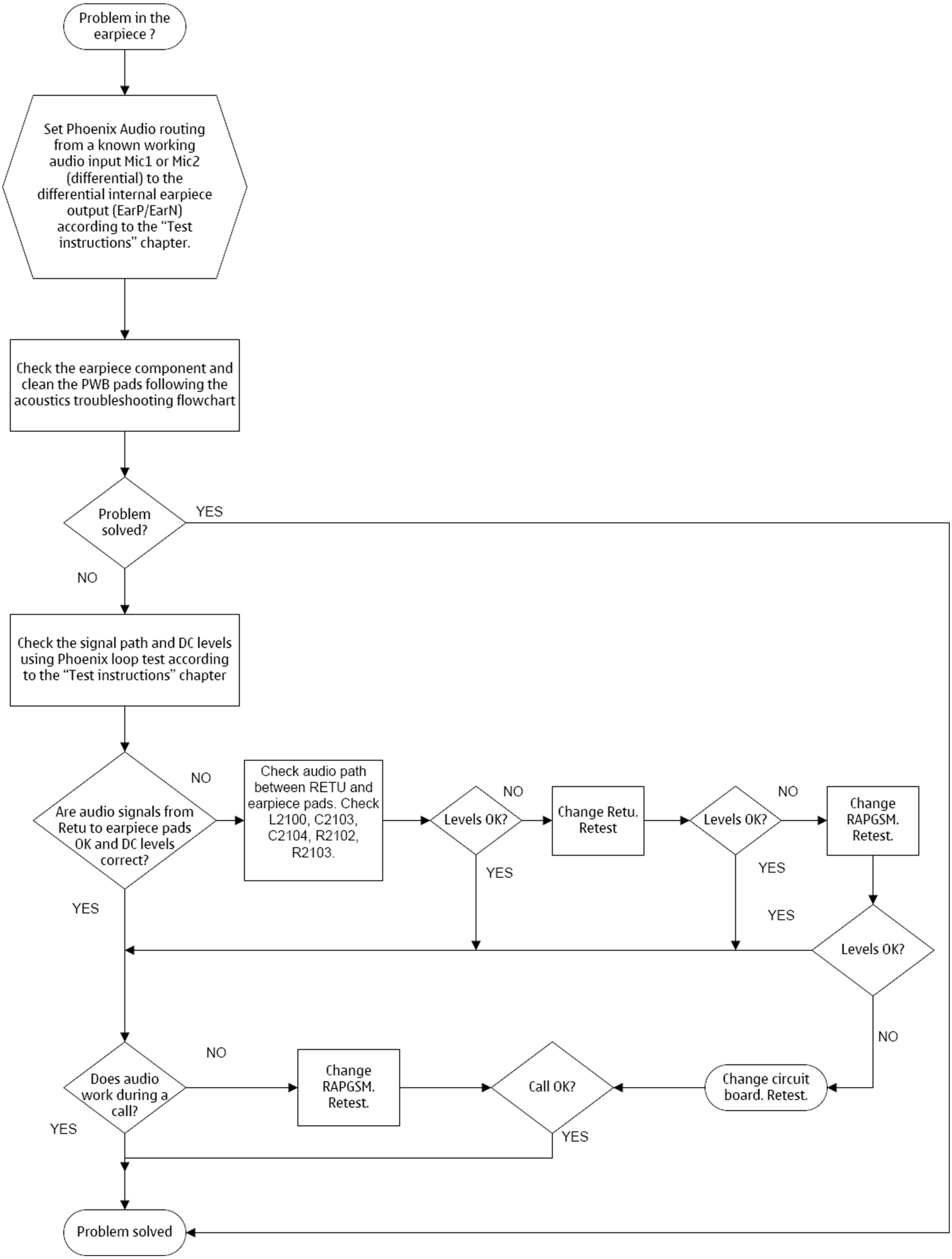
Single-ended measurement of XearL output from pop-port connector

Auto
User
Auto
V
2.000
1.750
1.500
1.250
1.000
0.750
0.500
0.250
0.000
0s
500.00µs
1.00ms
1.50ms
2.00ms
2.50ms
3.00ms
3.50ms
4.00ms
4.50ms
5.00ms

Figure 44 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

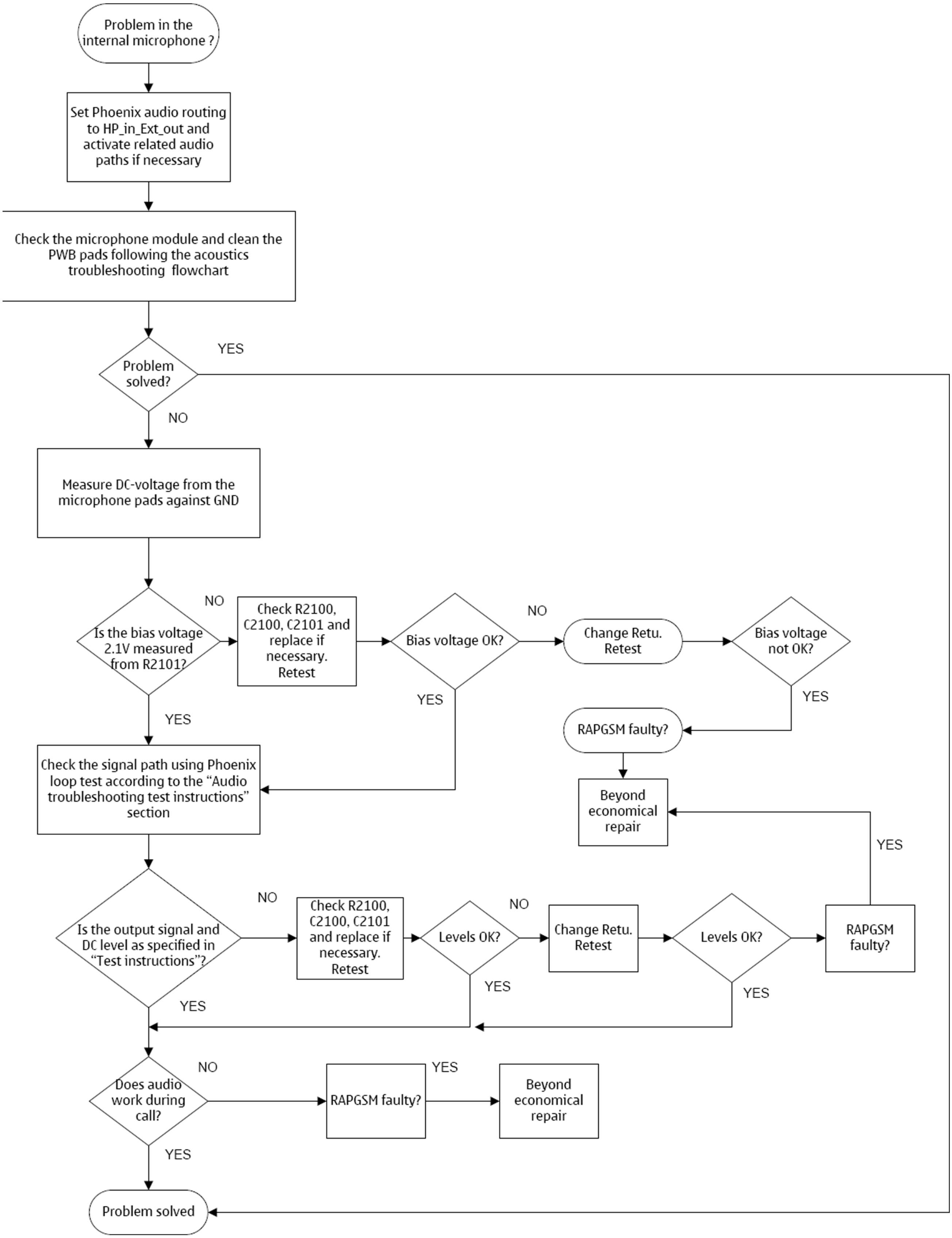
Internal earpiece troubleshooting

Troubleshooting flow


Problem in the earpiece ?
Set Phoenix Audio routing from a known working audio input Mic1 or Mic2 (differential) to the differential internal earpiece output (EarP/EarN) according to the "Test instructions" chapter.
Check the earpiece component and clean the PWB pads following the acoustics troubleshooting flowchart
Problem solved?
YES
NO
Check the signal path and DC levels using Phoenix loop test according to the "Test instructions" chapter
Are audio signals from Retu to earpiece pads OK and DC levels correct?
NO
Check audio path between RETU and earpiece pads. Check L2100, C2103, C2104, R2102, R2103.
Levels OK?
NO
Change Retu. Retest
Levels OK?
NO
Change RAPGSM. Retest.
YES
YES
YES
YES
Levels OK?
NO
Does audio work during a call?
NO
Change RAPGSM. Retest.
Call OK?
Change circuit board. Retest.
YES
YES
Problem solved

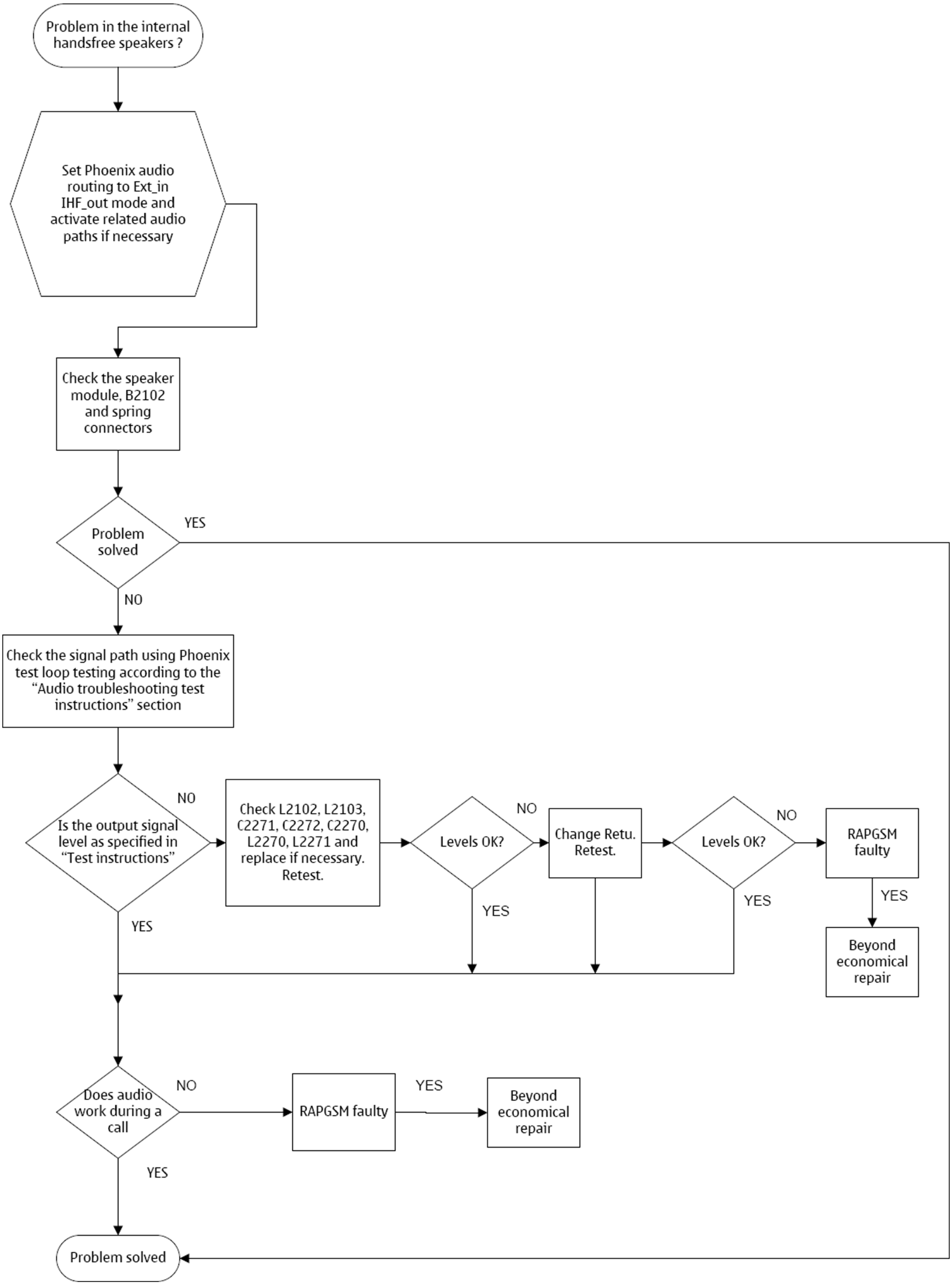
Internal microphone troubleshooting

Troubleshooting flow


Problem in the internal microphone ?
Set Phoenix audio routing to HP_in_Ext_out and activate related audio paths if necessary
Check the microphone module and clean the PWB pads following the acoustics troubleshooting flowchart
Problem solved?
YES
NO
Measure DC-voltage from the microphone pads against GND
Is the bias voltage 2.1V measured from R2101?
NO
Check R2100, C2100, C2101 and replace if necessary. Retest
Bias voltage OK?
NO
Change Retu. Retest
Bias voltage not OK?
YES
RAPGSM faulty?
Beyond economical repair
YES
YES
Check the signal path using Phoenix loop test according to the “Audio troubleshooting test instructions” section
YES
Is the output signal and DC level as specified in “Test instructions”?
NO
Check R2100, C2100, C2101 and replace if necessary. Retest
Levels OK?
NO
Change Retu. Retest
Levels OK?
RAPGSM faulty?
YES
YES
YES
Does audio work during call?
NO
RAPGSM faulty?
YES
Beyond economical repair
YES
Problem solved

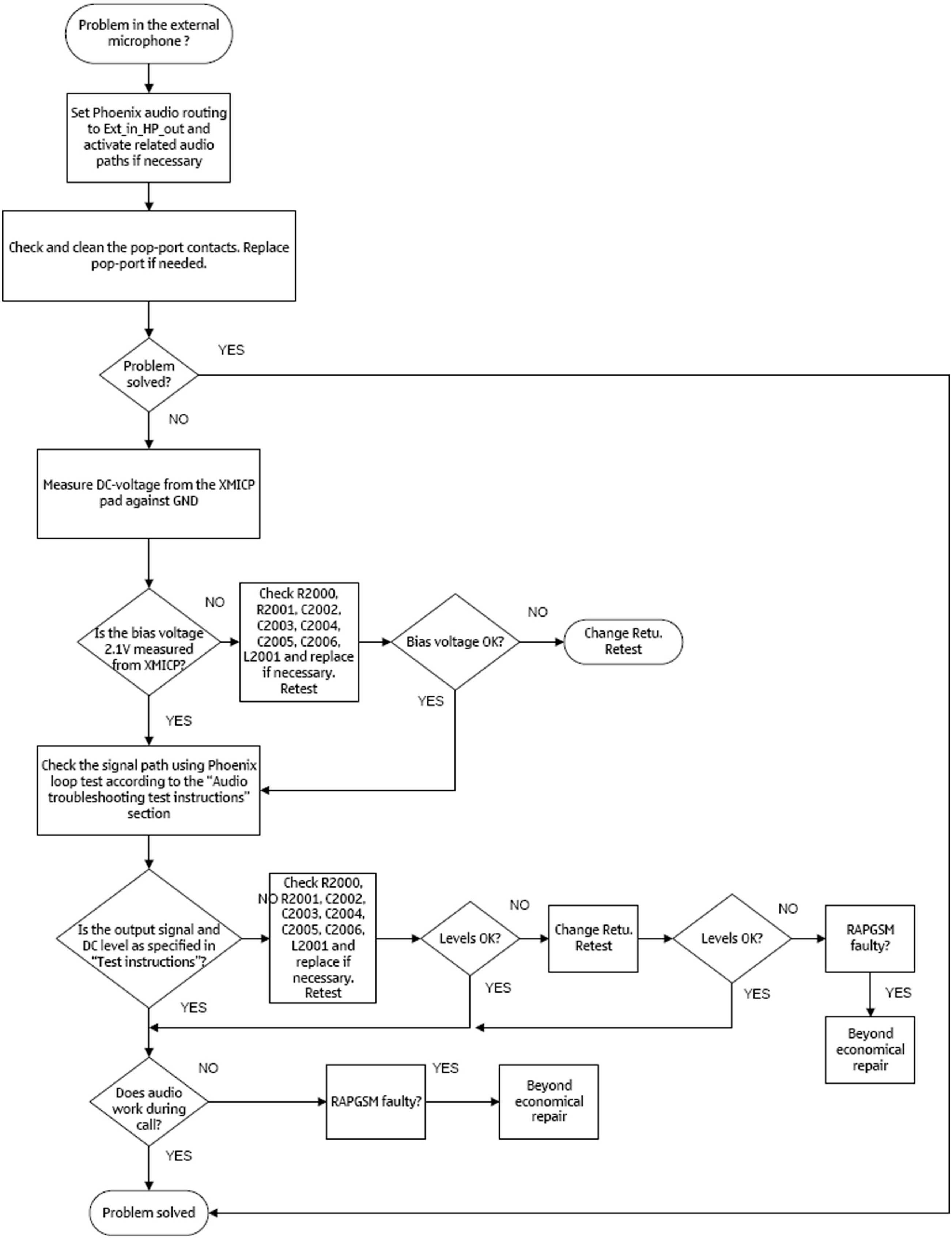
IHF speakers troubleshooting

Troubleshooting flow


Problem in the internal handsfree speakers ?
Set Phoenix audio routing to Ext_in IHF_out mode and activate related audio paths if necessary
Check the speaker module, B2102 and spring connectors
Problem solved
YES
NO
Check the signal path using Phoenix test loop testing according to the "Audio troubleshooting test instructions" section
Is the output signal level as specified in "Test instructions"
NO
YES
Check L2102, L2103, C2271, C2272, C2270, L2270, L2271 and replace if necessary. Retest.
Levels OK?
NO
YES
Change Retu. Retest.
Levels OK?
NO
YES
RAPGSM faulty
YES
Beyond economical repair
Does audio work during a call
NO
RAPGSM faulty
YES
Beyond economical repair
YES
Problem solved

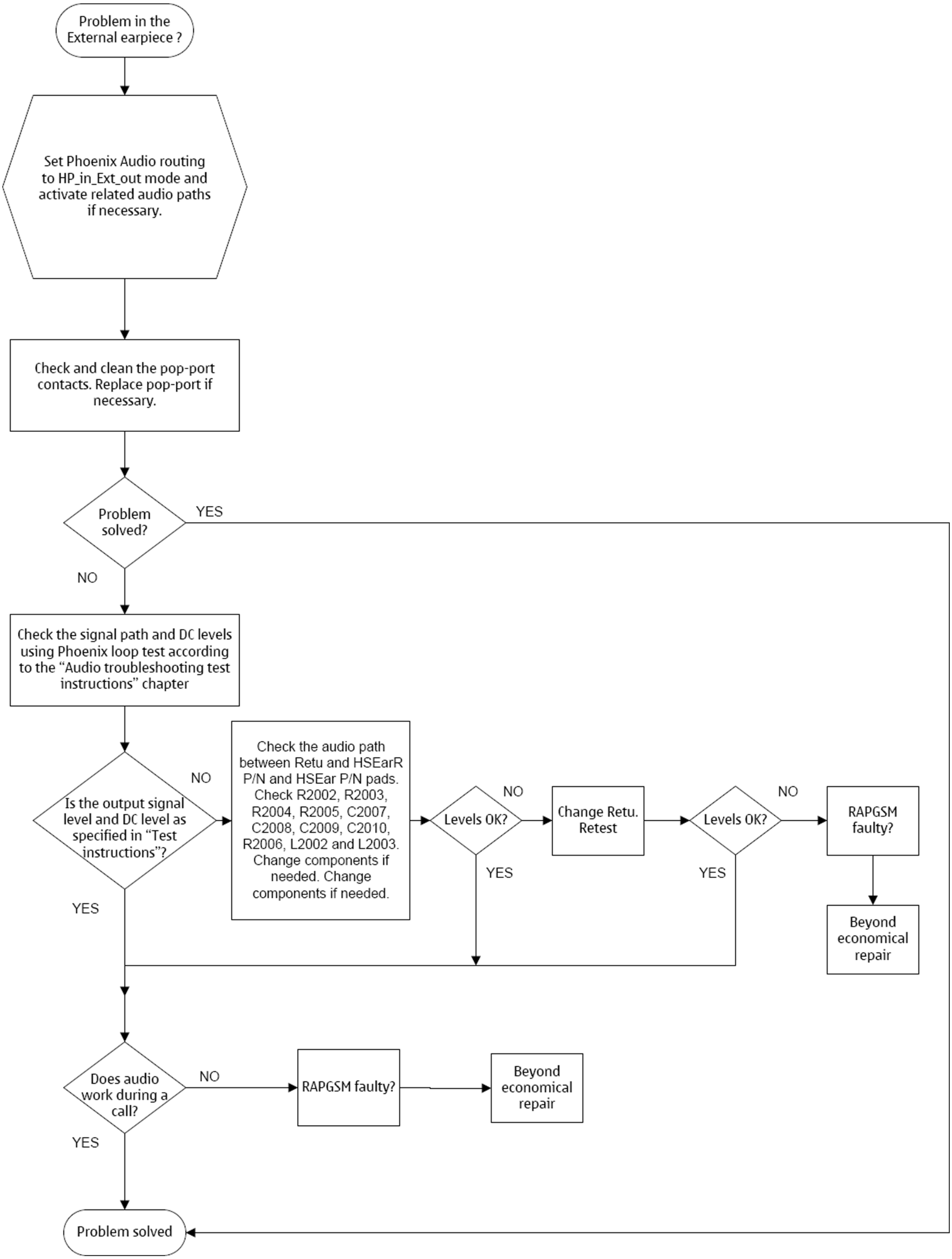
External microphone troubleshooting

Troubleshooting flow


Problem in the external microphone ?
Set Phoenix audio routing to Ext_in_HP_out and activate related audio paths if necessary
Check and clean the pop-port contacts. Replace pop-port if needed.
Problem solved?
YES
NO
Measure DC-voltage from the XMICP pad against GND
Is the bias voltage 2.1V measured from XMICP?
NO
Check R2000, R2001, C2002, C2003, C2004, C2005, C2006, L2001 and replace if necessary. Retest
Bias voltage OK?
NO
Change Retu. Retest
YES
YES
Check the signal path using Phoenix loop test according to the "Audio troubleshooting test instructions" section
Is the output signal and DC level as specified in "Test instructions"?
NO
Check R2000, R2001, C2002, C2003, C2004, C2005, C2006, L2001 and replace if necessary. Retest
Levels OK?
NO
Change Retu. Retest
Levels OK?
NO
RAPGSM faulty?
YES
Beyond economical repair
YES
YES
YES
Does audio work during call?
NO
RAPGSM faulty?
YES
Beyond economical repair
YES
Problem solved

External earpiece troubleshooting

Troubleshooting flow


Problem in the External earpiece ?
Set Phoenix Audio routing to HP_in_Ext_out mode and activate related audio paths if necessary.
Check and clean the pop-port contacts. Replace pop-port if necessary.
Problem solved?
YES
NO
Check the signal path and DC levels using Phoenix loop test according to the "Audio troubleshooting test instructions" chapter
Is the output signal level and DC level as specified in "Test instructions"?
NO
YES
Check the audio path between Retu and HSEarR P/N and HSEar P/N pads. Check R2002, R2003, R2004, R2005, C2007, C2008, C2009, C2010, R2006, L2002 and L2003. Change components if needed. Change components if needed.
Levels OK?
NO
YES
Change Retu. Retest
Levels OK?
NO
YES
RAPGSM faulty?
Beyond economical repair
Does audio work during a call?
NO
YES
RAPGSM faulty?
Beyond economical repair
Problem solved

Introduction to acoustics troubleshooting

Acoustics troubleshooting

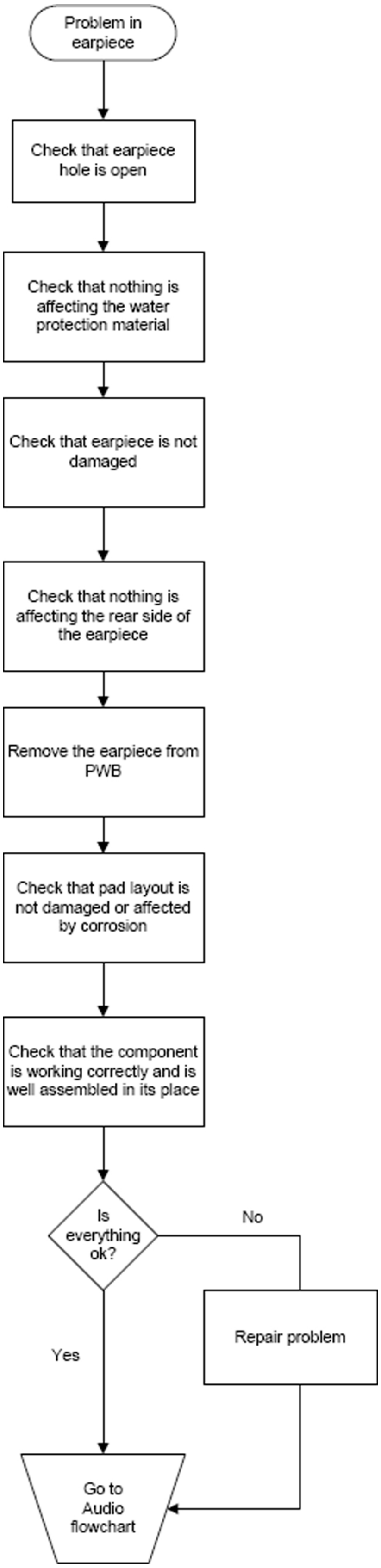
Acoustics design ensures that the sound is detected correctly with a microphone and properly radiated to the outside of the device by speaker(s). The acoustics of the phone includes three basic systems: earpiece, Integrated Hands Free (IHF) and microphone.

The sound reproduced from the earpiece readiates through a single hole on the front cover (A-cover). The sound reproduced from the IHF speakers radiates from the sound holes on top of the unit. The microphone holes are located at the bottom of the unit.

For a correct functionality of the phone, all sound holes must be always open. When the phone is used, care must be taken not to close any of those holes with a hand or fingers. The phone should be dry and clean, and no objects must be located in such a way that they close any of the holes.

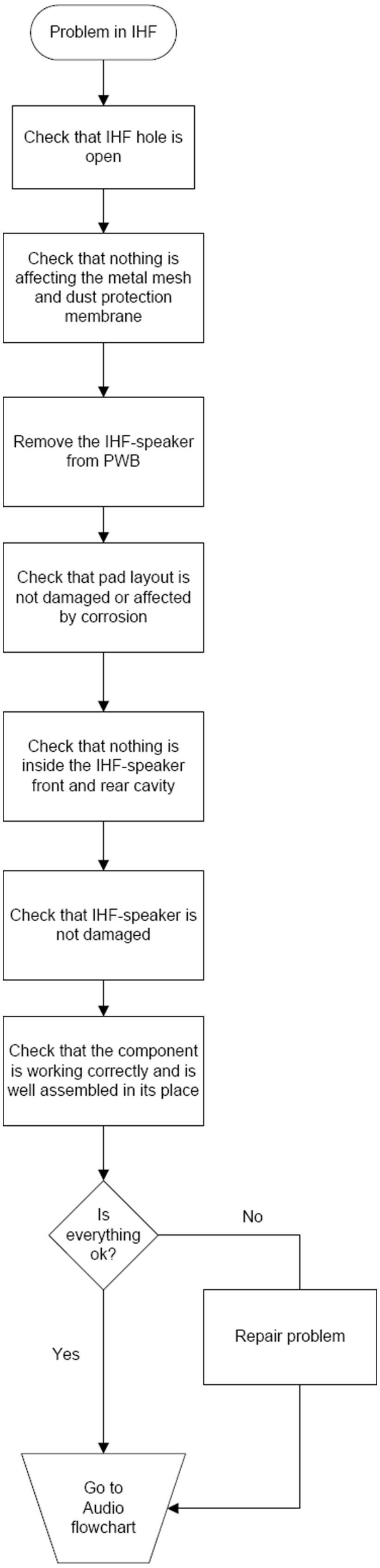
Earpiece troubleshooting

Troubleshooting flow


Problem in earpiece
Check that earpiece hole is open
Check that nothing is affecting the water protection material
Check that earpiece is not damaged
Check that nothing is affecting the rear side of the earpiece
Remove the earpiece from PWB
Check that pad layout is not damaged or affected by corrosion
Check that the component is working correctly and is well assembled in its place
Is everything ok?
No
Repair problem
Yes
Go to Audio flowchart

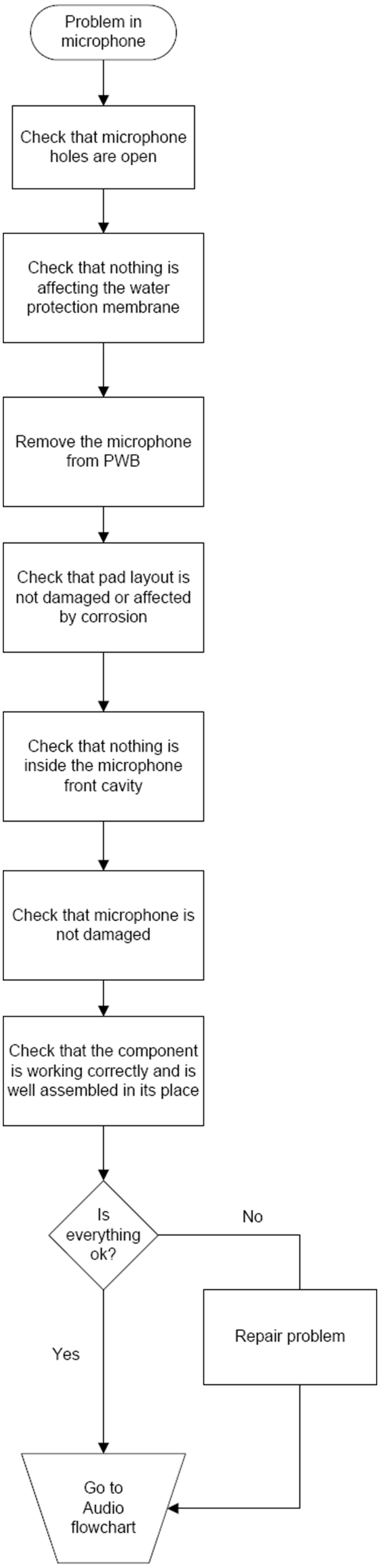
IHF troubleshooting

Troubleshooting flow


Problem in IHF
Check that IHF hole is open
Check that nothing is affecting the metal mesh and dust protection membrane
Remove the IHF-speaker from PWB
Check that pad layout is not damaged or affected by corrosion
Check that nothing is inside the IHF-speaker front and rear cavity
Check that IHF-speaker is not damaged
Check that the component is working correctly and is well assembled in its place
Is everything ok?
No
Repair problem
Yes
Go to Audio flowchart

Microphone troubleshooting

Troubleshooting flow


Problem in microphone
Check that microphone holes are open
Check that nothing is affecting the water protection membrane
Remove the microphone from PWB
Check that pad layout is not damaged or affected by corrosion
Check that nothing is inside the microphone front cavity
Check that microphone is not damaged
Check that the component is working correctly and is well assembled in its place
Is everything ok?
No
Repair problem
Yes
Go to Audio flowchart

Baseband manual tuning guide

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File**→ **Scan Product.**
4. Choose **Tuning**→**Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.
8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 9 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
IBAT (ICal) Gain	5750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

7 — RF Troubleshooting and Manual Tuning Guide

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Introduction to RF troubleshooting

All measurements should be done using:

- spectrum analyser with a high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels)
- oscilloscope with a 10:1 probe (DC-voltages and low frequency signals)

> **Caution:** Also all measurements with an RF coupler should be performed in RF shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use an RF shielded environment, it should be checked that there are no transmissions on the same frequencies as used in the tests.

The RF section of the phone is build around one RF ASIC: ASIC N7505.

> **Note:** Before changing N7505, please check the following things: supply voltages and serial communication coming from baseband to N7505 are OK. Please note that the grounding of the Front End Module (FEM: N7520) is directly below the component, so it is difficult to check or change.

Most RF semiconductors are static discharge sensitive! ESD protection must be taken care of during repair (ground straps and ESD soldering irons). N7505 and N7520 are moisture sensitive, so parts must be pre-baked prior to soldering.

In addition to key components, there are lot of discrete components (resistors, inductors and capacitors) which troubleshooting is done mainly by checking if the soldering of the component is done properly.

Capacitor can be checked for shorts and resistors for value by means of an ohmmeter, but be aware in-circuit measurements should be evaluated carefully as other components connected to the same node can change the seen resistance.

Keep in mind that all measured voltages or RF levels depicted in the service manual are rough figures. Especially RF levels vary because of different measuring equipment or different grounding of the probe used.

When using an RF probe, use a pair of metallic tweezers to connect the probe ground to the PWB ground as close to the measurement point as possible. If measurements are performed in a product specific module jig, then “GND” pads should be used for the probe ground.

RF key component placement

The RF section of the phone is build around one RF ASIC: ASIC N7505.

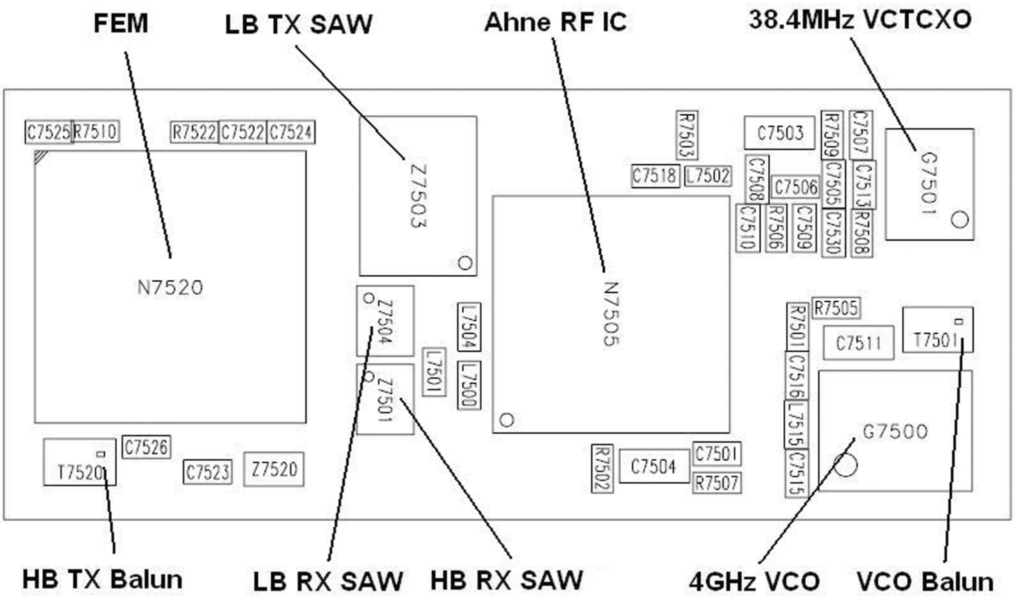

FEM
LB TX SAW
Ahne RF IC
38.4MHz VCTCXO
C7525
R7510
R7522
C7522
C7524
Z7503
R7503
C7503
R7509
C7507
G7501
C7518
L7502
C7508
C7506
C7505
C7513
C7510
R7506
C7509
C7530
R7508
N7520
Z7504
L7504
N7505
R7505
R7501
C7511
T7501
L7501
L7500
Z7501
C7516
L7515
G7500
C7526
T7520
C7523
Z7520
R7502
C7504
C7501
R7507
C7515
HB TX Balun
LB RX SAW
HB RX SAW
4GHz VCO
VCO Balun

Figure 45 RM-86 RF bottom side key components

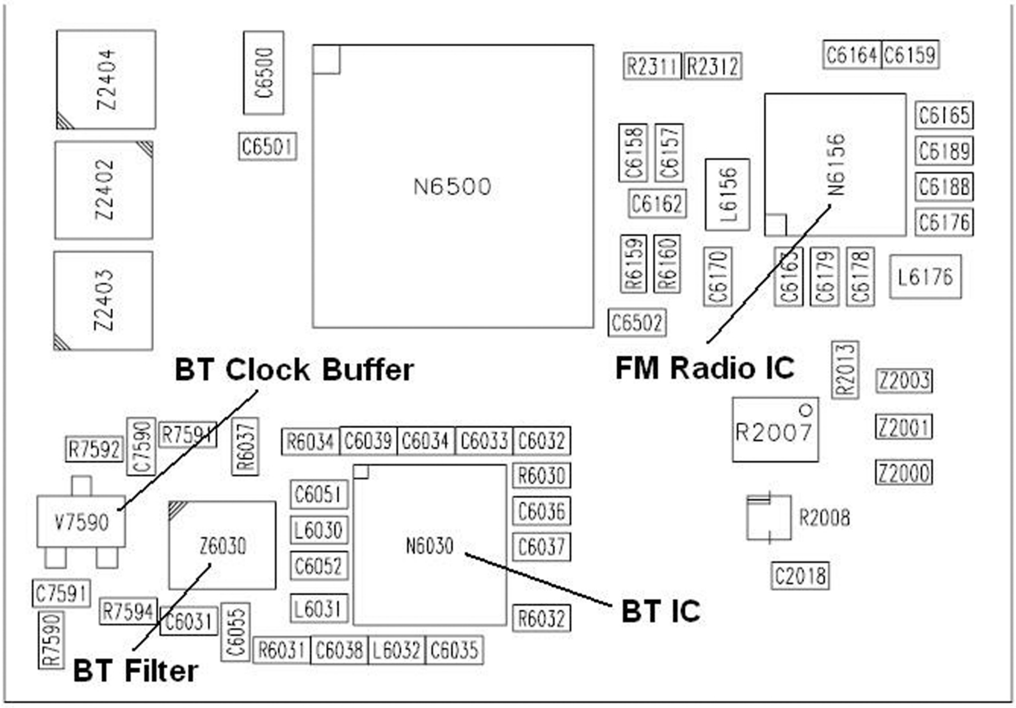

Z2404
Z2402
Z2403
C6500
C6501
N6500
R2311
R2312
C6164
C6159
C6158
C6157
C6162
L6156
N6156
C6165
C6189
C6188
C6176
R6159
R6160
C6170
C6163
C6179
C6178
L6176
C6502
BT Clock Buffer
FM Radio IC
R2013
Z2003
Z2001
Z2000
R2007
R2008
C2018
R7592
C7590
R7591
R6037
R6034
C6039
C6034
C6033
C6032
R6030
C6036
C6037
C6051
L6030
C6052
L6031
N6030
Z6030
V7590
C7591
R7594
C6031
C6055
R7590
R6031
C6038
L6032
C6035
R6032
BT IC
BT Filter

Figure 46 RM-86 RF top side key components

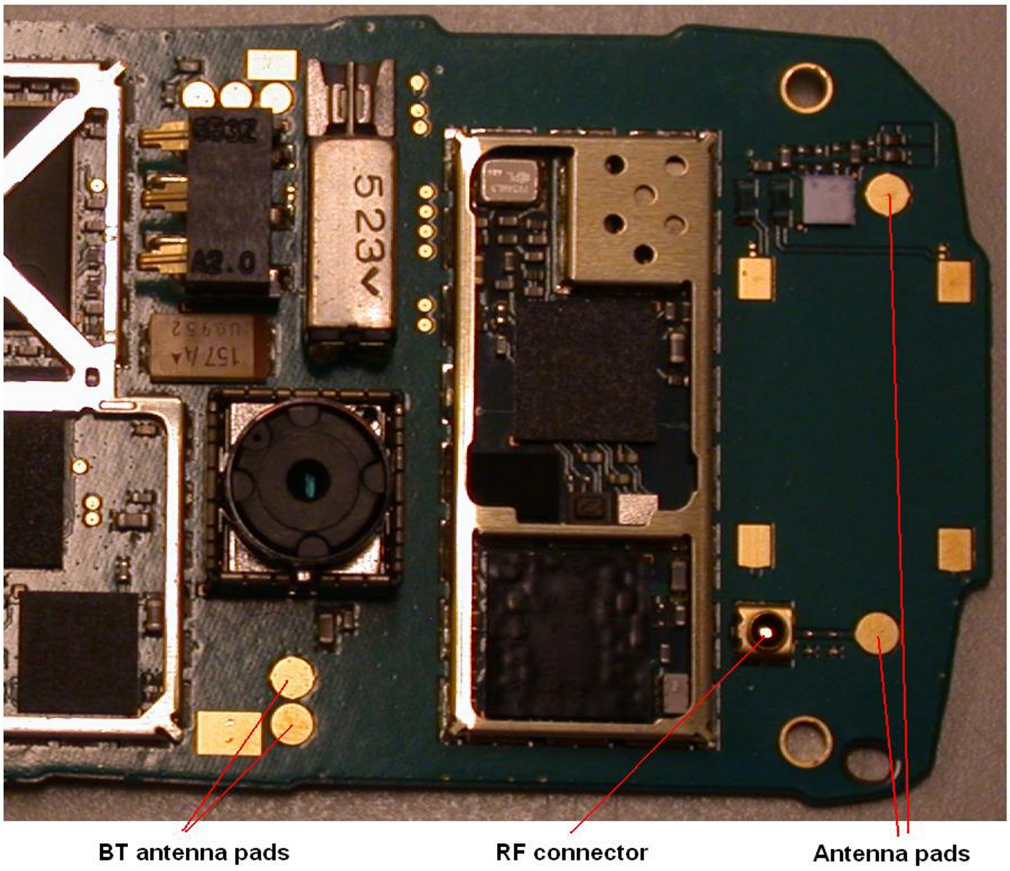

BT antenna pads
RF connector
Antenna pads

Figure 47 RM-86 antenna connector placement

Receiver troubleshooting

Introduction to RX troubleshooting

Rx can be tested by making a phone call or in the local mode. For the local mode testing, use Phoenix service software.

The main Rx troubleshooting measurement is RSSI measurement. This test measures the signal strength of the received signal. I and Q branches can be measured separately.

In GSM, the input signal can be either a real GSM signal or a CW signal that is 67.771kHz up from the carrier frequency.

For service tool usage instructions, refer to section Service Tools and Service Concepts.

General instructions for RX troubleshooting

Steps

1. Connect a test jig to a computer with a DKU-2 cable or to a FPS-10 flash prommer with a modular cable (XCS-4).

   Make sure that you have a PKD-1 dongle connected to the computer's parallel port.
2. Connect a DC power supply to a module test jig (MJ-52).

   Note: Set the DC supply voltage to 12 V and set the jumper connector on the test jig's **reg.pass** switch to “ON” position.
3. Connect an RF cable between the RF connector of the module test jig (MJ-52) and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy load in the module test jig RF connector, otherwise GSM may be damaged.

   Note: Make sure that all connections are made to the correct RF connector.
4. Set Rx on.

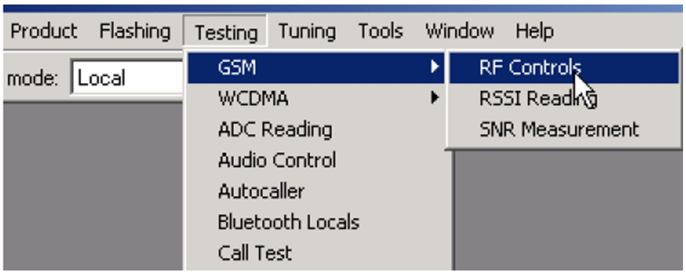
   i Set the phone module to the test jig and start *Phoenix service software*.

   ii Initialize connection to the phone. (With FPS-10 use FBUS driver when using DKU-2 and COMBOX driver).

   iii From the File menu, choose product: **File -> Choose Product -> xx-x*** (* = type designator of the phone, scan product).

   iv From the toolbar, set operating mode to “Local”.
5. EGSM900/1800/1900 troubleshooting

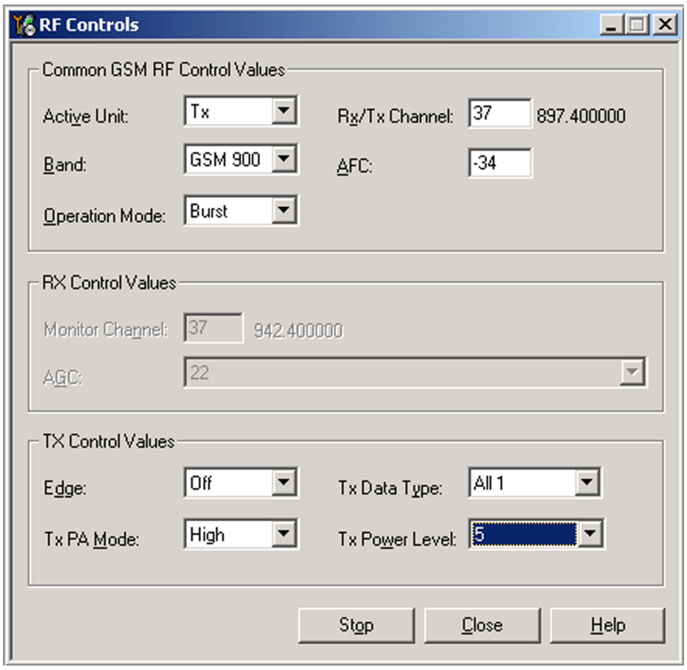
   i From the Testing menu, activate the *RF Controls* window: **Testing -> GSM -> RF Controls** .



   ii In the *RF Controls* window:

   - Select band “GSM900” or “GSM1800” or “GSM1900” (Default = “GSM900”).
   - Set Active unit to “Rx” (Default = “Rx”).
   - Set Operation mode to “Burst” (Default = “Burst”).

- Set Rx/Tx channel to 37 on GSM900 band or 700 on GSM1800 band or 661 on GSM1900 (Defaults).
- Set Edge to “Off” (Default). (Not active in RXmode).
- Set Tx PA mode to “Free” (Default). (Not active in RXmode).
- Apply 942.46771 MHz (channel 37 + 67.710 kHz offset), 1842.86771 MHz (channel 700 + 67.710 kHz offset) or 1960.06771 MHz (channel 661 + 67.71 kHz) –90 dBm signal to the RF-connector (remember to compensate for cable attenuation).



Common GSM RF Control Values
Active Unit: Tx
Rx/Tx Channel: 37 897.400000
Band: GSM 900
AFC: -34
Operation Mode: Burst

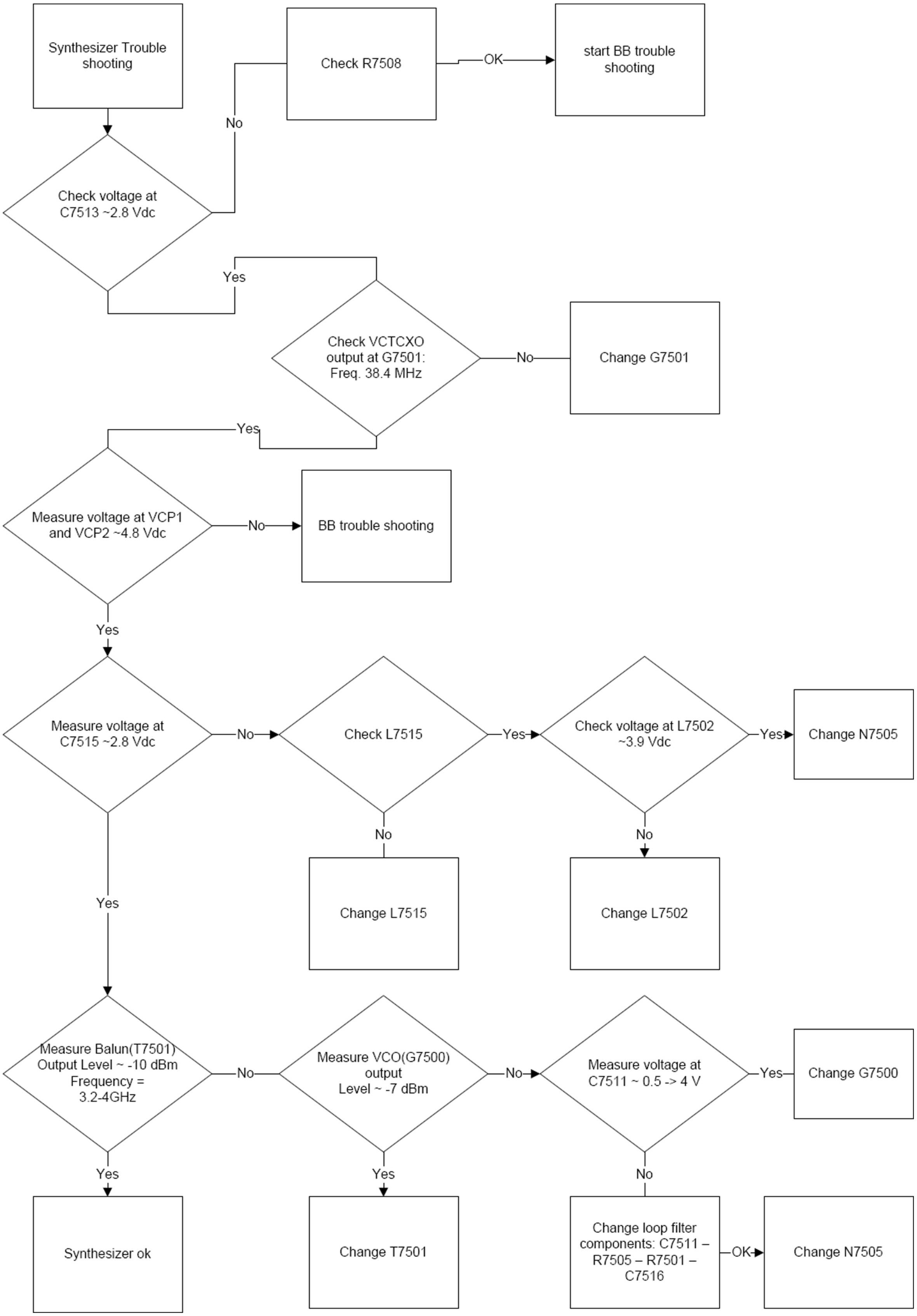
RX Control Values
Monitor Channel: 37 942.400000
AGC: 22

TX Control Values
Edge: Off
Tx Data Type: All 1
Tx PA Mode: High
Tx Power Level: 5

Figure 48 RF Controls window

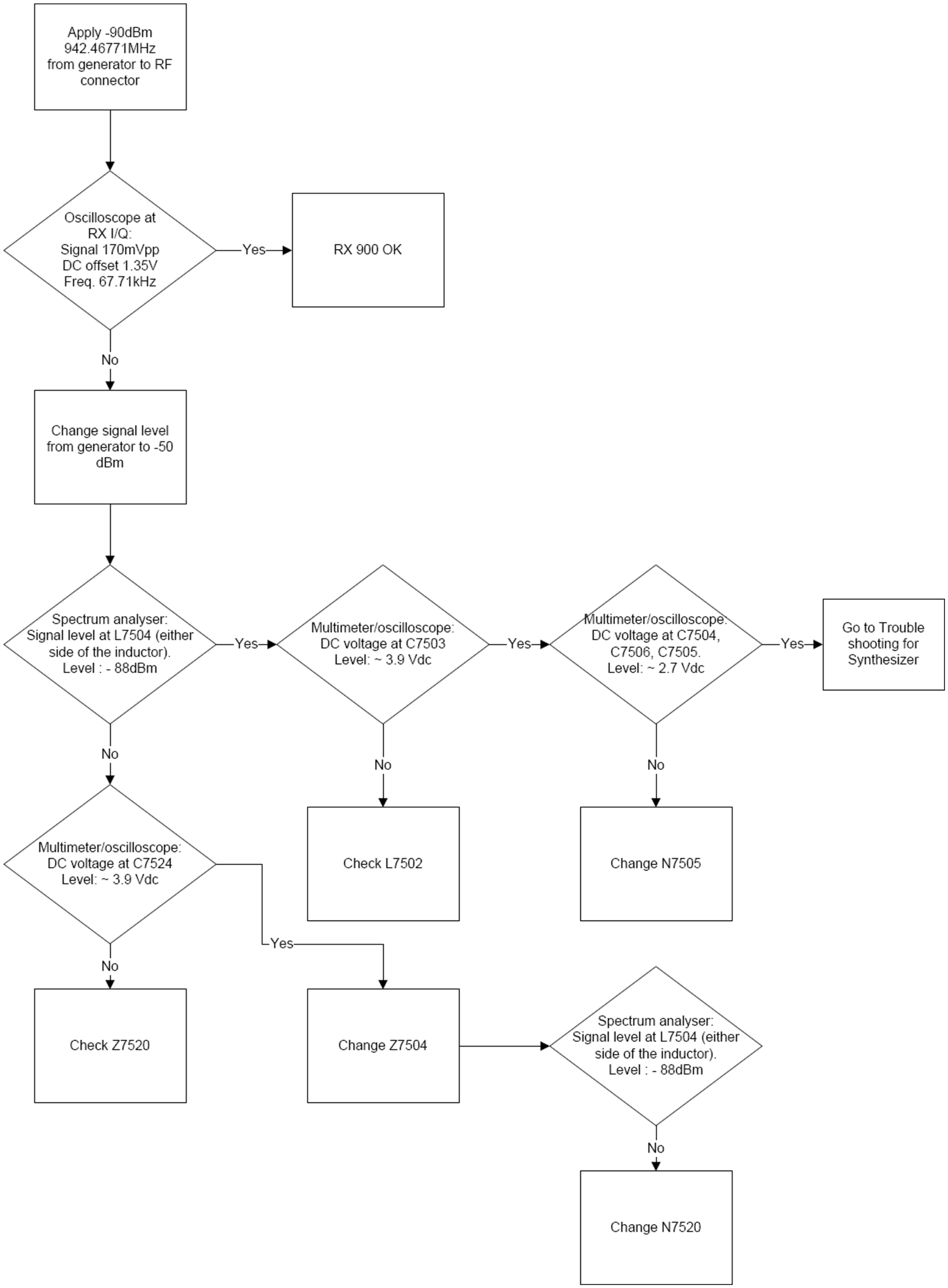
Synthesizer troubleshooting

Troubleshooting flow


Synthesizer Trouble shooting
Check R7508
OK
start BB trouble shooting
No
Check voltage at C7513 ~2.8 Vdc
Yes
Check VCTCXO output at G7501: Freq. 38.4 MHz
No
Change G7501
Yes
Measure voltage at VCP1 and VCP2 ~4.8 Vdc
No
BB trouble shooting
Yes
Measure voltage at C7515 ~2.8 Vdc
No
Check L7515
Yes
Check voltage at L7502 ~3.9 Vdc
Yes
Change N7505
No
Change L7515
No
Change L7502
Yes
Measure Balun(T7501) Output Level ~ -10 dBm Frequency = 3.2-4GHz
No
Measure VCO(G7500) output Level ~ -7 dBm
No
Measure voltage at C7511 ~ 0.5 -> 4 V
Yes
Change G7500
Yes
Synthesizer ok
Yes
Change T7501
No
Change loop filter components: C7511 – R7505 – R7501 – C7516
OK
Change N7505

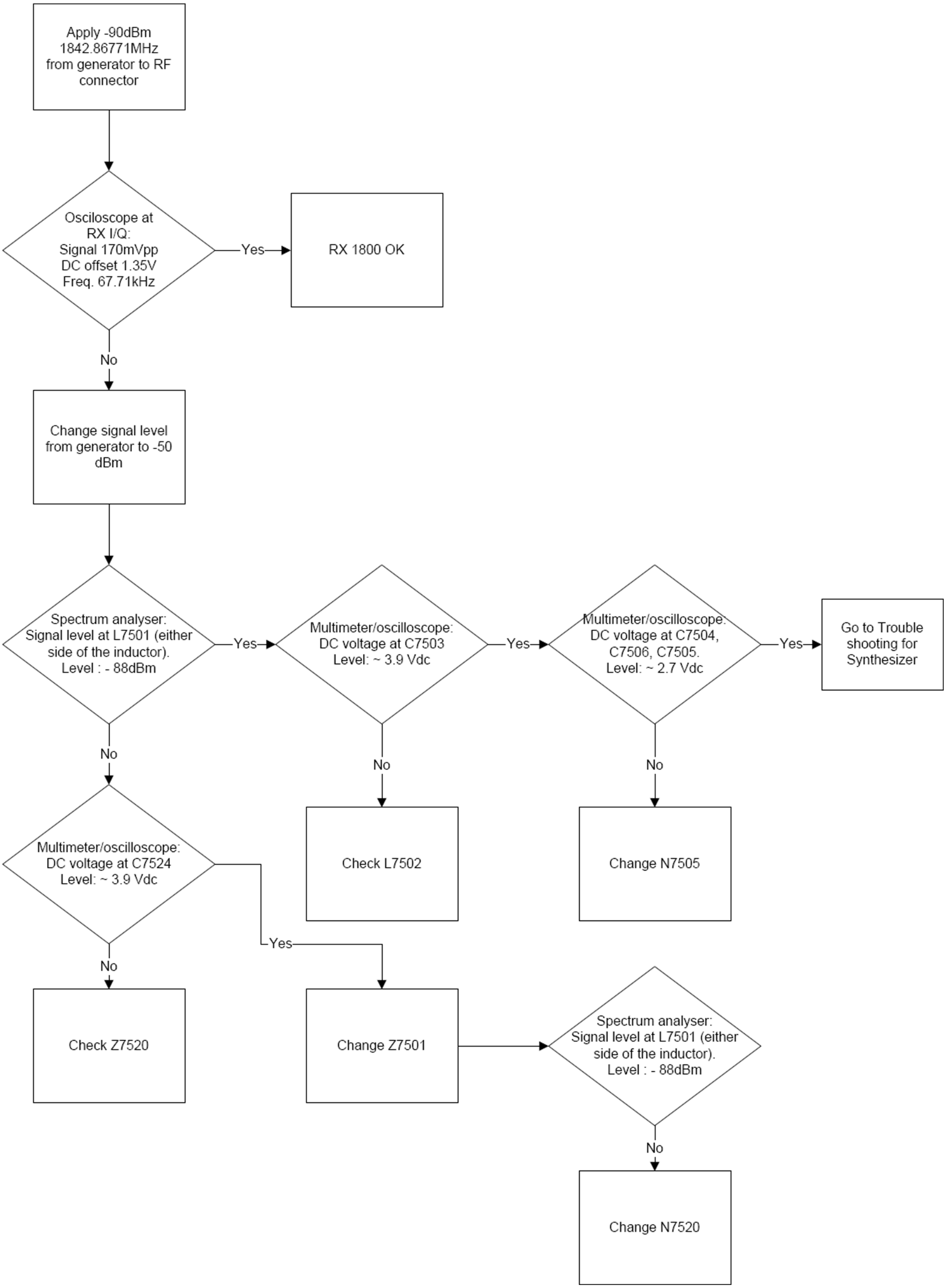
GSM900 troubleshooting

Troubleshooting flow


Apply -90dBm 942.46771MHz from generator to RF connector
Oscilloscope at RX I/Q: Signal 170mVpp DC offset 1.35V Freq. 67.71kHz
Yes
RX 900 OK
No
Change signal level from generator to -50 dBm
Spectrum analyser: Signal level at L7504 (either side of the inductor). Level : - 88dBm
Yes
Multimeter/oscilloscope: DC voltage at C7503 Level: ~ 3.9 Vdc
Yes
Multimeter/oscilloscope: DC voltage at C7504, C7506, C7505. Level: ~ 2.7 Vdc
Yes
Go to Trouble shooting for Synthesizer
No
No
No
Multimeter/oscilloscope: DC voltage at C7524 Level: ~ 3.9 Vdc
Check L7502
Change N7505
Yes
No
Check Z7520
Change Z7504
Spectrum analyser: Signal level at L7504 (either side of the inductor). Level : - 88dBm
No
Change N7520

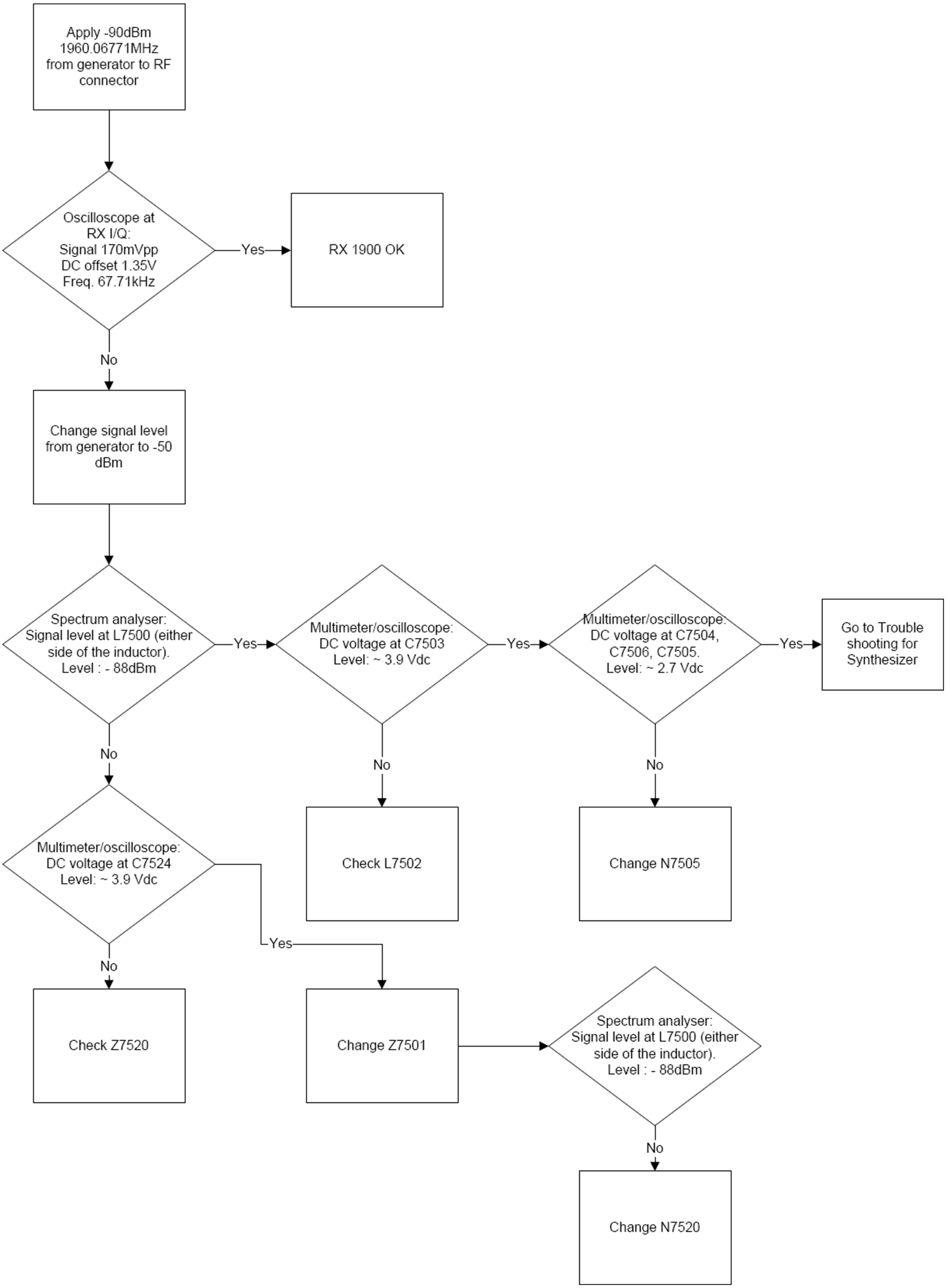
GSM1800 troubleshooting

Troubleshooting flow


Apply -90dBm 1842.86771MHz from generator to RF connector
Osciloscope at RX I/Q: Signal 170mVpp DC offset 1.35V Freq. 67.71kHz
Yes
RX 1800 OK
No
Change signal level from generator to -50 dBm
Spectrum analyser: Signal level at L7501 (either side of the inductor). Level : - 88dBm
Yes
Multimeter/oscilloscope: DC voltage at C7503 Level: ~ 3.9 Vdc
Yes
Multimeter/oscilloscope: DC voltage at C7504, C7506, C7505. Level: ~ 2.7 Vdc
Yes
Go to Trouble shooting for Synthesizer
No
No
No
Multimeter/oscilloscope: DC voltage at C7524 Level: ~ 3.9 Vdc
Check L7502
Change N7505
Yes
No
Check Z7520
Change Z7501
Spectrum analyser: Signal level at L7501 (either side of the inductor). Level : - 88dBm
No
Change N7520

GSM1900 troubleshooting

Troubleshooting flow


Apply -90dBm 1960.06771MHz from generator to RF connector
Oscilloscope at RX I/Q: Signal 170mVpp DC offset 1.35V Freq. 67.71kHz
Yes
RX 1900 OK
No
Change signal level from generator to -50 dBm
Spectrum analyser: Signal level at L7500 (either side of the inductor). Level : - 88dBm
Yes
Multimeter/oscilloscope: DC voltage at C7503 Level: ~ 3.9 Vdc
Yes
Multimeter/oscilloscope: DC voltage at C7504, C7506, C7505. Level: ~ 2.7 Vdc
Yes
Go to Trouble shooting for Synthesizer
No
Multimeter/oscilloscope: DC voltage at C7524 Level: ~ 3.9 Vdc
No
Check L7502
No
Change N7505
Yes
No
Check Z7520
Change Z7501
Spectrum analyser: Signal level at L7500 (either side of the inductor). Level : - 88dBm
No
Change N7520

GSM Rx chain activation for manual measurements / GSM RSSI measurement

Context

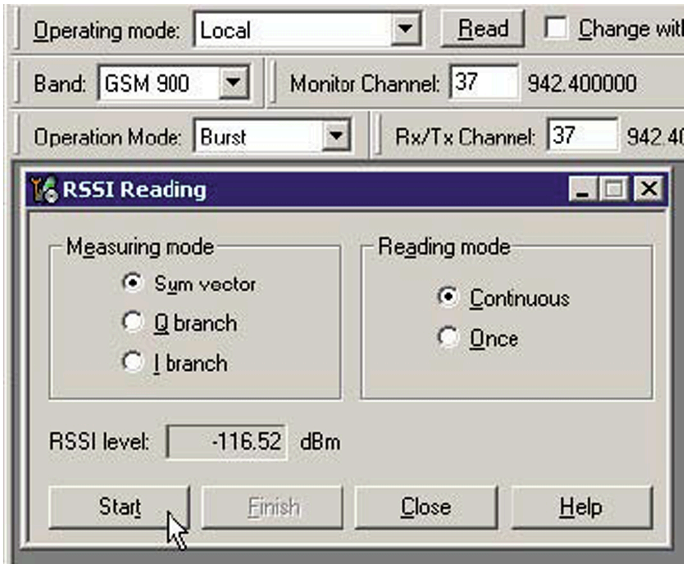
RSSI signal measurement is the main Rx troubleshooting measurement. The test measures the strength of the received signal.

I and Q branches can be measured separately. In GSM, the input signal can be either real GSM signal or a CW (Continuous Wave) signal that is 67.771 kHz above the carrier frequency.

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→GSM→RSSI Reading** .
3. Set the RF signal generator for channel frequency +67.771 kHz CW mode with –80 dBm signal.

   Alternatively set the cellular tester downlink channel to the appropriate channel. Make sure that the tester is set to continuous mode, not to burst mode.
4. In the *RSSI Reading* window, select the appropriate band and channel.



Operating mode: Local
☐ Change wit
Band: GSM 900
Monitor Channel: 37 942.400000
Operation Mode: Burst
Rx/Tx Channel: 37 942.4

Measuring mode:
● Sum vector
○ Q branch
○ I branch

Reading mode:
● Continuous
○ Once

RSSI level: -116.52 dBm

Figure 49 *RSSI Reading* window

5. To start the measurement, activate GSM Rx chain, click **Start**.

Results

RSSI reading values of the selected band and channel are displayed. The RSSI level must be the same value which is set at the signal generator (-80 dBm).

Transmitter troubleshooting

General instructions for TX troubleshooting

Context

- Tx troubleshooting requires Tx operation.
- Do not transmit on frequencies that are in use!
- Transmitter can be controlled in the local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is "RF Controls".

- Tx IQ tuning and Tx power tuning can be also used in some cases.
- Remember that retuning is not a fix! Phones are tuned correctly in production.

The first set of steps instructs how to assemble the test setup. This setup is general for all Tx troubleshooting tasks.

Alternative steps provide specific troubleshooting instructions for *Phoenix* service software.

> **Caution:** Never activate the GSM transmitter without a proper antenna load. There should be always 50 ohm load connected to the RF connector (antenna, RF-measurement equipment or at least 2 watts dummy load), otherwise GSM PA may be damaged.

Steps

1. Connect a test jig to a computer with a DKU-2 cable or to a FPS-10 flash prommer with a modular cable (XCS-4).

   Make sure that you have a PKD-1 dongle connected to the computer's parallel port.
2. Connect a DC power supply to a module jig (MJ-52).

   > **Note:** When repairing or tuning a transmitter, use an external DC supply with at least 3 A current capability.
   >
   > Set the DC supply voltage to 12V and set the jumper connector on the test jig's **reg.pass** switch to “ON” position.
3. Connect an RF cable between the RF connector of the module test jig (MJ-52) and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy load in the module test jig RF connector, otherwise GSM may be damaged.

   > **Note:** There are two antenna connectors in the module jig:
   >
   > - one for GSM
   > - one for Bluetooth
   >
   > Make sure that all connections are made to the correct RF connector.

   Normally a spectrum analyser is used as measurement equipment.

   > **Note:** The maximum input power of a spectrum analyser is +30 dBm.
   >
   > To prevent any damage, it is recommended to use 10 dB attenuator on the spectrum analyzer input.
4. Set Tx on.

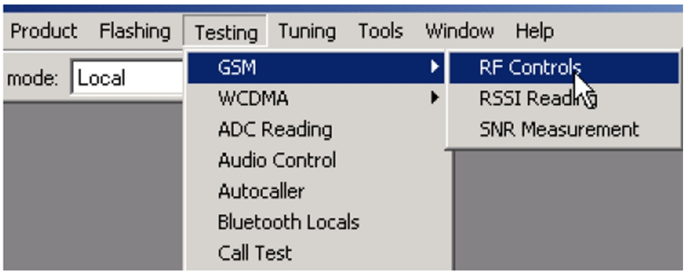
   i Set the phone module to the test jig and start *Phoenix service software*.

   ii Initialize connection to the phone. (With FPS-10 use FBUS driver when using DAU-9S and COMBOX driver).

   iii From the File menu, choose product: **File -> Choose Product -> xx-x*** (* = type designator of the phone).

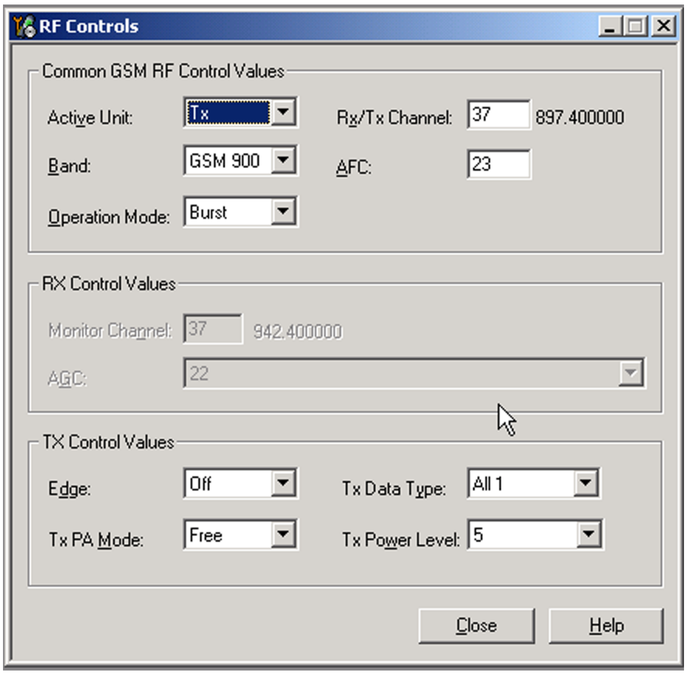
   iv From the toolbar, set operating mode to “Local”.
5. EGSM900/1800/1900 troubleshooting

   i From the Testing menu, activate the *RF Controls* window: **Testing -> GSM -> RF Controls** .


Product
Flashing
Testing
Tuning
Tools
Window
Help
mode:
Local
GSM
WCDMA
ADC Reading
Audio Control
Autocaller
Bluetooth Locals
Call Test
RF Controls
RSSI Reading
SNR Measurement

ii In the *RF Controls* window:

- Select band “GSM900” or “GSM1800” or “GSM1900” (Default = “GSM900”).
- Set Active unit to “Tx” (Default = “Rx”).
- Set Operation mode to “Burst” (Default = “Burst”).
- Set Tx data type to “Random” (Default = “All1”).
- Set Rx/Tx channel to 37 on GSM900 band or 700 on GSM1800 band or 661 on GSM1900 (Defaults).
- Set Edge to “Off” (Default).
- Set Tx PA mode to “Free” (Default).
- Set power level to 5 (Default = 19) on GSM900 or to 0 (Default = 15) on GSM1800 or GSM1900.


RF Controls
Close
Help

Common GSM RF Control Values

Active Unit: Tx
Rx/Tx Channel: 37 897.400000
Band: GSM 900
AFC: 23
Operation Mode: Burst

RX Control Values

Monitor Channel: 37 942.400000
AGC: 22

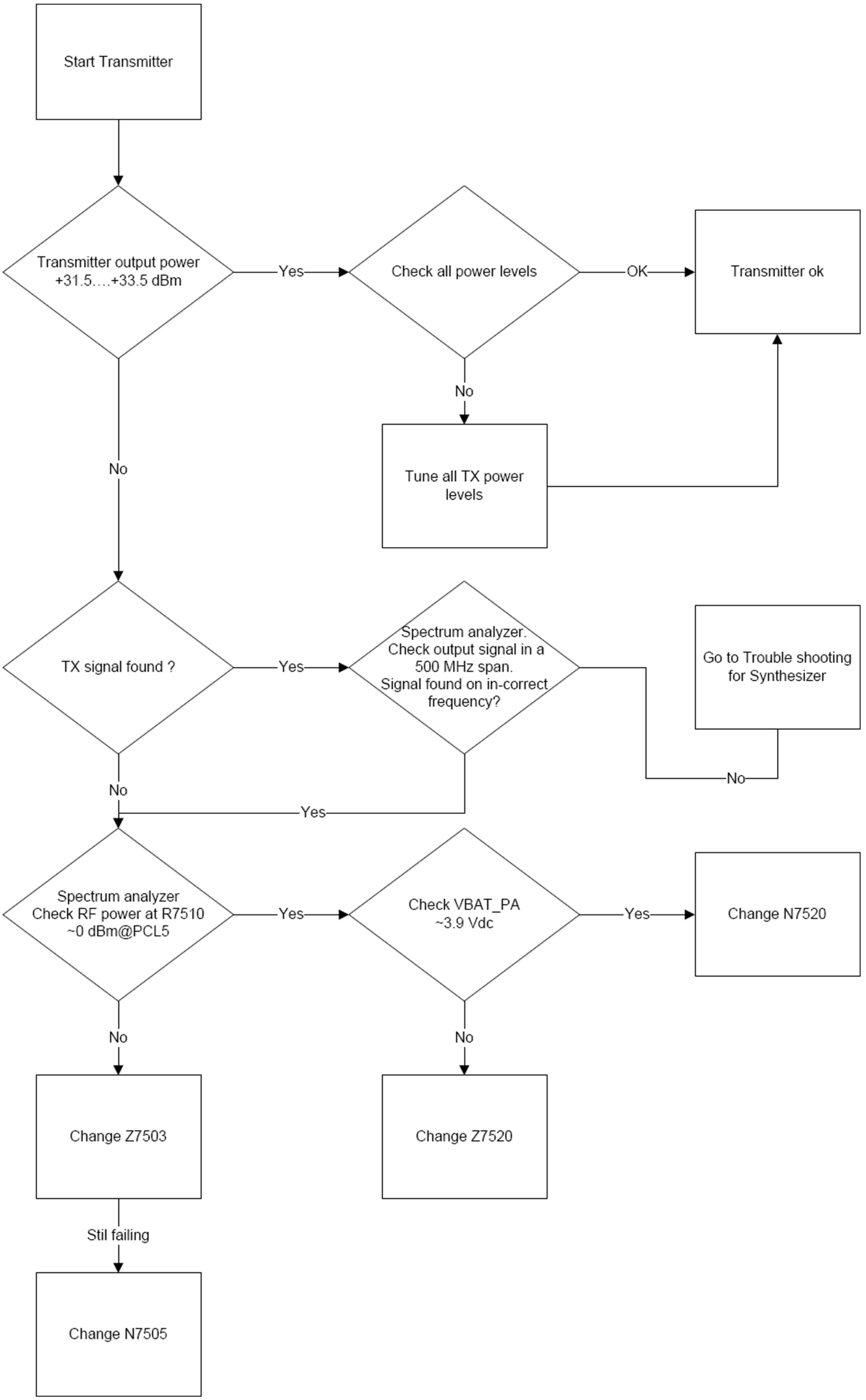
TX Control Values

Edge: Off
Tx Data Type: All 1
Tx PA Mode: Free
Tx Power Level: 5

Figure 50 RF Controls window

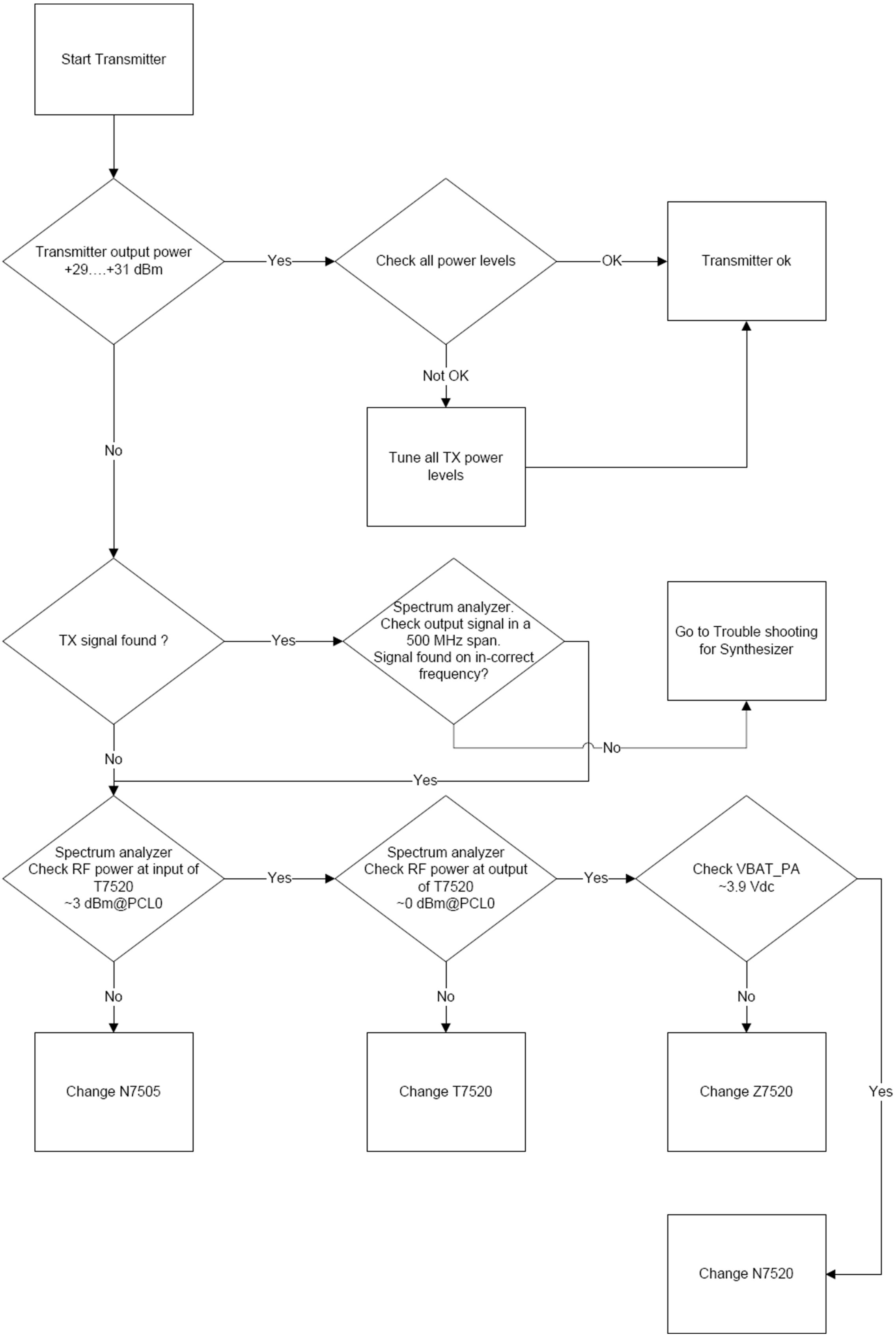
TX 900 troubleshooting

Troubleshooting flow


Start Transmitter
Transmitter output power +31.5….+33.5 dBm
Yes
Check all power levels
OK
Transmitter ok
No
Tune all TX power levels
No
TX signal found ?
Yes
Spectrum analyzer. Check output signal in a 500 MHz span. Signal found on in-correct frequency?
Go to Trouble shooting for Synthesizer
No
No
Yes
Spectrum analyzer Check RF power at R7510 ~0 dBm@PCL5
Yes
Check VBAT_PA ~3.9 Vdc
Yes
Change N7520
No
No
Change Z7503
Change Z7520
Stil failing
Change N7505

TX 1800/1900 troubleshooting

Troubleshooting flow


Start Transmitter
Transmitter output power +29….+31 dBm
Yes
Check all power levels
OK
Transmitter ok
Not OK
Tune all TX power levels
No
TX signal found ?
Yes
Spectrum analyzer. Check output signal in a 500 MHz span. Signal found on in-correct frequency?
Go to Trouble shooting for Synthesizer
No
No
Yes
Spectrum analyzer Check RF power at input of T7520 ~3 dBm@PCL0
Yes
Spectrum analyzer Check RF power at output of T7520 ~0 dBm@PCL0
Yes
Check VBAT_PA ~3.9 Vdc
No
No
No
Yes
Change N7505
Change T7520
Change Z7520
Change N7520

Checking antenna functionality

The main antenna element consist of two antennas; GSM and Bluetooth.

In the GSM antenna there is one Feed and one GND contact.

The contacts of the GSM antenna are separated in the (RDC = 0 ohm) short-circuit.

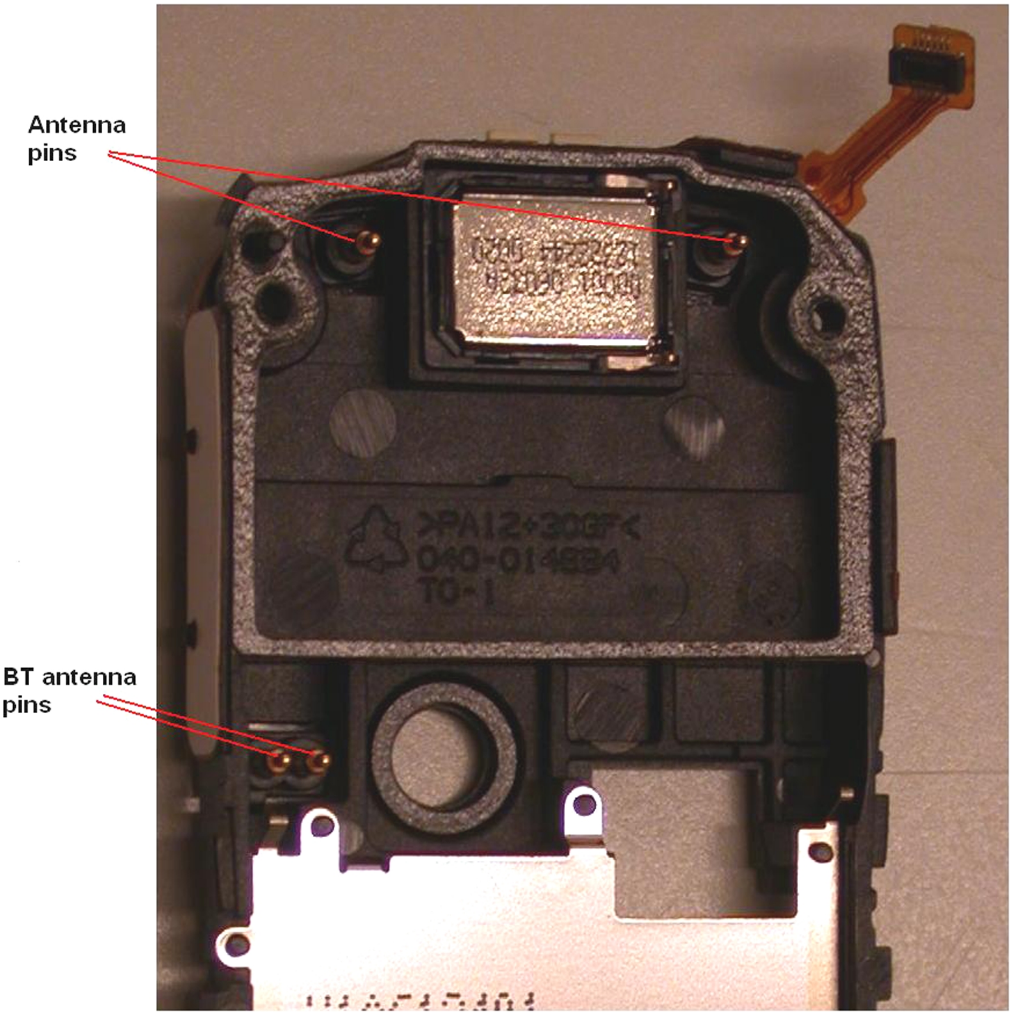


Figure 51 Main antenna

The antenna is functioning normally when the contacts function (RDC = 0 ohm) and the antenna is visually intact.

BT antenna

BT antenna has one Feed and one GND contact. The antenna is functioning normally when the contacts function (RDC = 0 ohm) and the antenna is visually intact.

RF tunings

Introduction to RF tunings

Important: Only perform RF tunings if:

- one or more of the RF components is changed
- flash Memory chip is changed or otherwise corrupted.

RF calibration is always performed with the help of a product-specific module jig, never with an RF coupler. Using an RF coupler in the calibration phase will cause a complete mistuning of the RF side.

> **Important:** After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken in account when the phone is tuned. As all the RF losses are frequency dependent, the user have to be very careful and understand the measurement setup. In the following table there are RF attenuations of the module jig:

Band	Attenuation
GSM900	0.2 dB
GSM1800	0.3 dB
GSM1900	0.3 dB

RF autotuning

Prerequisites

For information on the recommended test set-up, refer to the corresponding information on PWS/NOL.

Before you can use the auto-tune feature, the GPIB driver from the GPIB card vendor must be installed and running.

The autotune **.ini** file must be in a correct place: **C:\Program Files\Nokia\Phoenix\products\xx-x*\autotune_xx-x*.ini** (**= indicates the type designator of the phone, e.g. RM-1*)

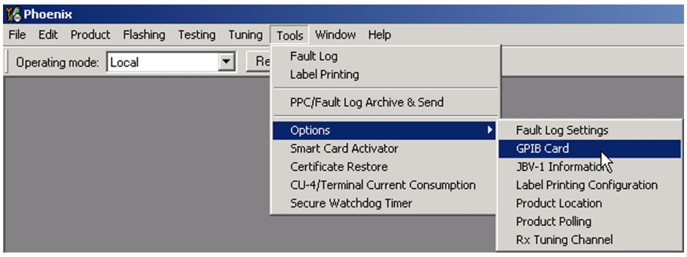
Context

RF autotuning is performed with the aid of Digital Radio Communication Tester. Autotuning covers all RF tunings that are needed to perform after RF component repairs.

> **Note:** Do not perform RF autotuning without a proper reason. Phones are tuned in production and an RF tuning may be performed only after component repairs or if the RF tuning information is lost.

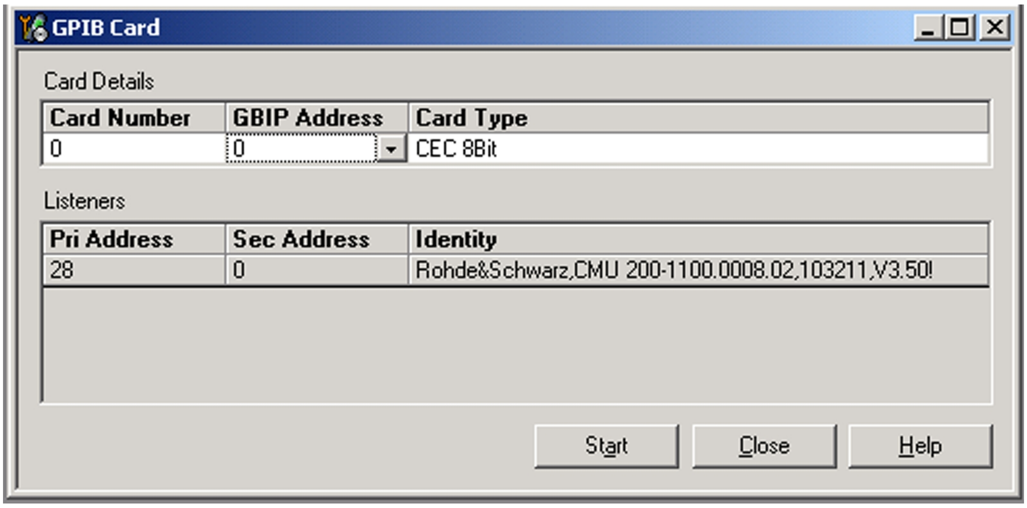
Steps

1. Connect the communication tester to the GPIB bus.
2. Start Phoenix service software.
3. From the Tools menu, choose Options -> GPIB Card.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Operating mode:
Local
Re
Fault Log
Label Printing
PPC/Fault Log Archive & Send
Options
Smart Card Activator
Certificate Restore
CU-4/Terminal Current Consumption
Secure Watchdog Timer
Fault Log Settings
GPIB Card
JBV-1 Information
Label Printing Configuration
Product Location
Product Polling
Rx Tuning Channel

4. In the Card Type line, select CEC8Bit, then click Start.

   After clicking Start, the name of the communication tester appears in the list of found Listeners.


GPIB Card

Card Details

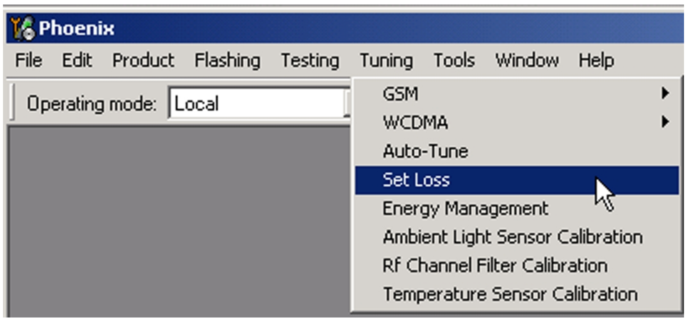
Card Number	GBIP Address	Card Type
0	0	CEC 8Bit

Listeners

Pri Address	Sec Address	Identity
28	0	Rohde&Schwarz,CMU 200-1100.0008.02,103211,V3.50!

Start
Close
Help

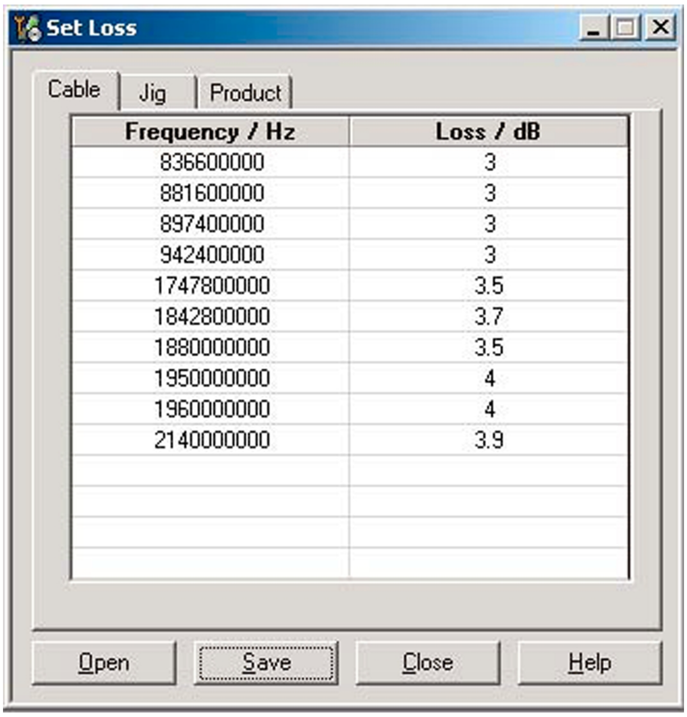
5. To specify the cable loss from module jig to the communication tester, choose "Set Loss" from the Tuning menu.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration

Operating mode: Local

6. Click the Cable tab and add the extra cable attenuation.

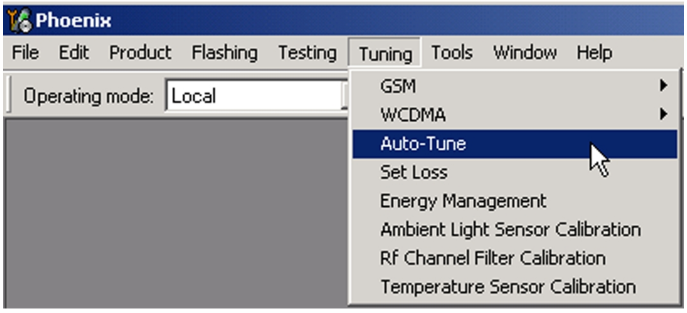
   Note: Cable losses have to be determined on the basis of a cable used.


Set Loss
Cable
Jig
Product

Frequency / Hz	Loss / dB
836600000	3
881600000	3
897400000	3
942400000	3
1747800000	3.5
1842800000	3.7
1880000000	3.5
1950000000	4
1960000000	4
2140000000	3.9

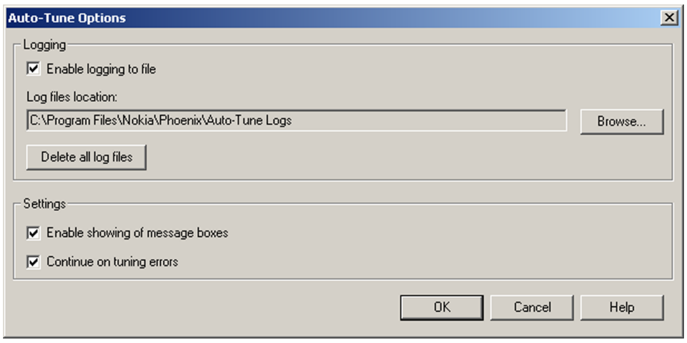
Open
Save
Close
Help

7. To start autotuning, choose Auto-Tune from the Tuning menu.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration

Operating mode: Local

8. In the Auto-Tune window, click Options.
9. In the Auto-Tune options window, see that the "Enable showing of messages" check box is checked, then click OK.


Auto-Tune Options
Logging
Browse...
Delete all log files
Settings
OK
Cancel
Help

☑ Enable logging to file

Log files location: C:\Program Files\Nokia\Phoenix\Auto-Tune Logs

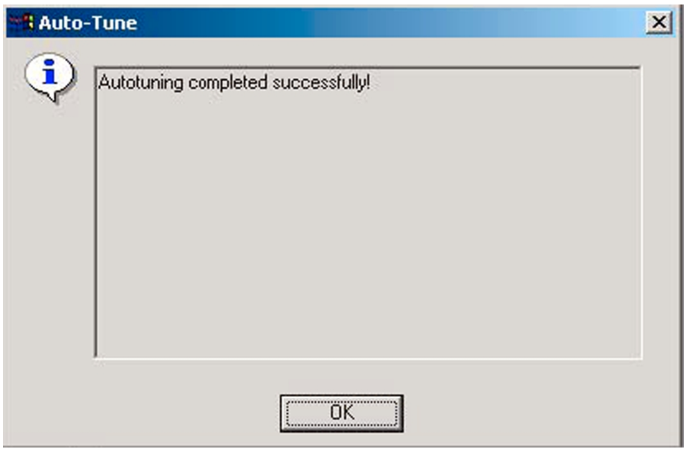
☑ Enable showing of message boxes

☑ Continue on tuning errors

10. To complete the RF autotuning, click OK.

Results

"Autotuning completed successfully" message appears.


Auto-Tune
OK

Autotuning completed successfully!

System mode independent manual tunings

Rf channel filter calibration

Context

Rf channel filter calibration tunes the internal low pass filters of Rx and Tx ASICs that limit the bandwidth of BB IQ signals.

One common calibration is made for GSM.

Table 10 Rf channel filter calibration tuning limits

	Min	Typ	Max
Tx filter	0	10	31
Rx filter	0	16	31

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Rf Channel Filter Calibration** .
3. Click **Tune**.
4. To save the values to the PMM (Phone Permanent Memory) area, click **Write**.
5. To close the *Rf Channel Filter Calibration* window, click **Close**.

Results

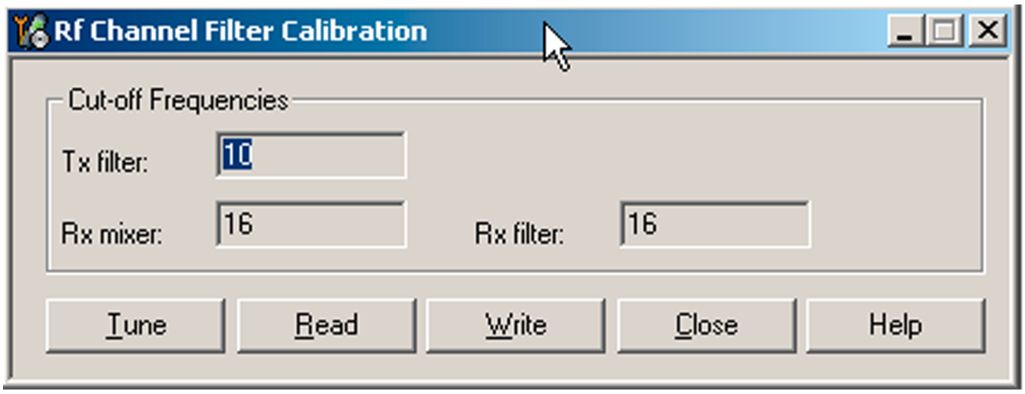

Rf Channel Filter Calibration
Cut-off Frequencies
Tx filter: 10
Rx mixer: 16
Rx filter: 16

Figure 52 Rf channel filter calibration typical values

PA (power amplifier) detection

Context

The PA detection procedure detects which PA manufacturer is used for phone PAs.

If a PA is changed or if the permanent memory (PMM) data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→PA Detection** .
3. Click **Tune**.
4. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
5. To end the procedure, click **Close**.

GSM receiver tunings

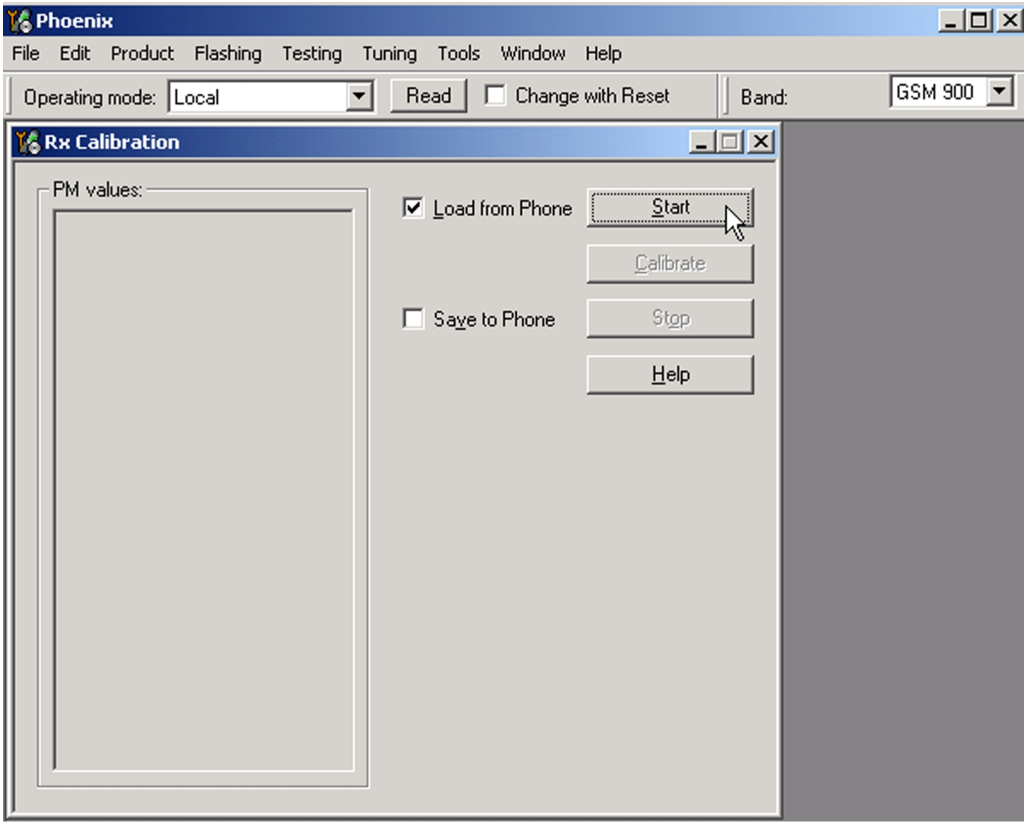
Rx calibration (GSM)

Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→GSM→Rx Calibration** .
5. Check the **Load from Phone** check box, and uncheck **Save to Phone**.
6. From the **Band** drop-down menu, choose e.g. **GSM900**.
7. Click **Start**.



Operating mode: Local

☐ Change with Reset

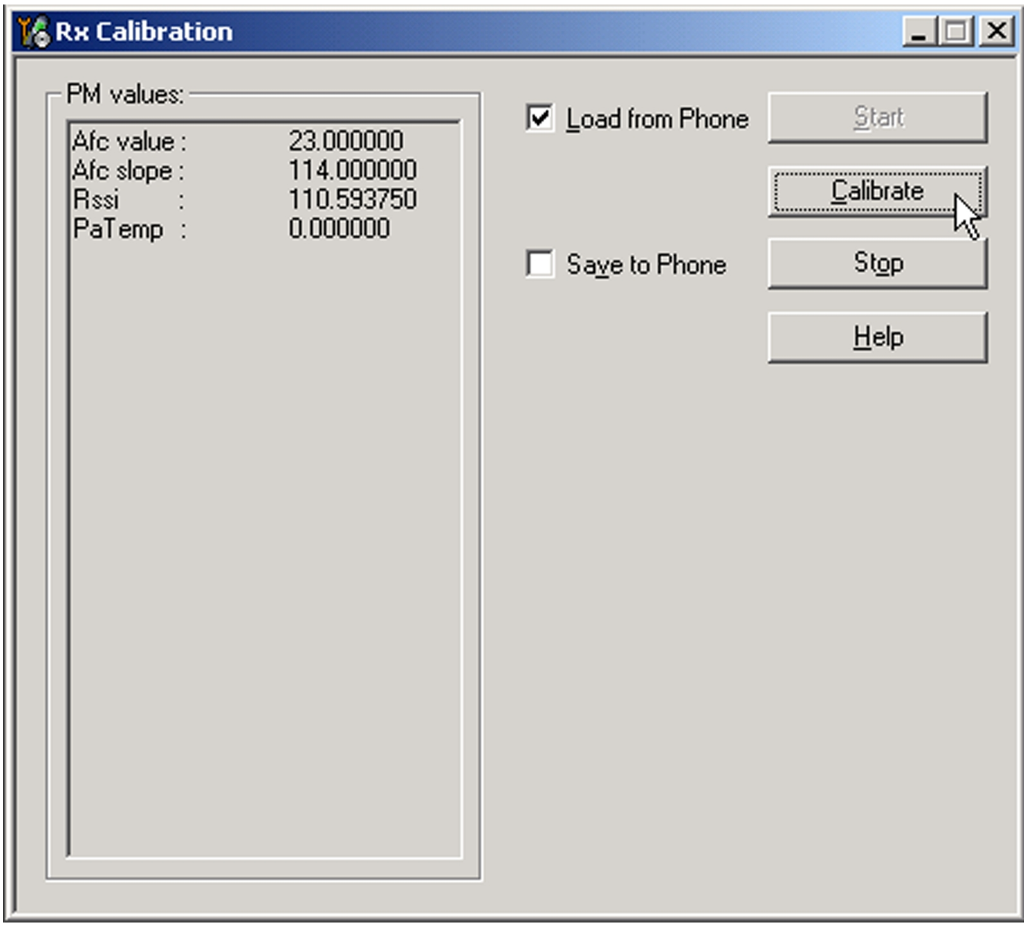
Band: GSM 900

☑ Load from Phone

☐ Save to Phone

Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
Read
Rx Calibration
PM values:
Start
Calibrate
Stop
Help

8. Click **Calibrate**.

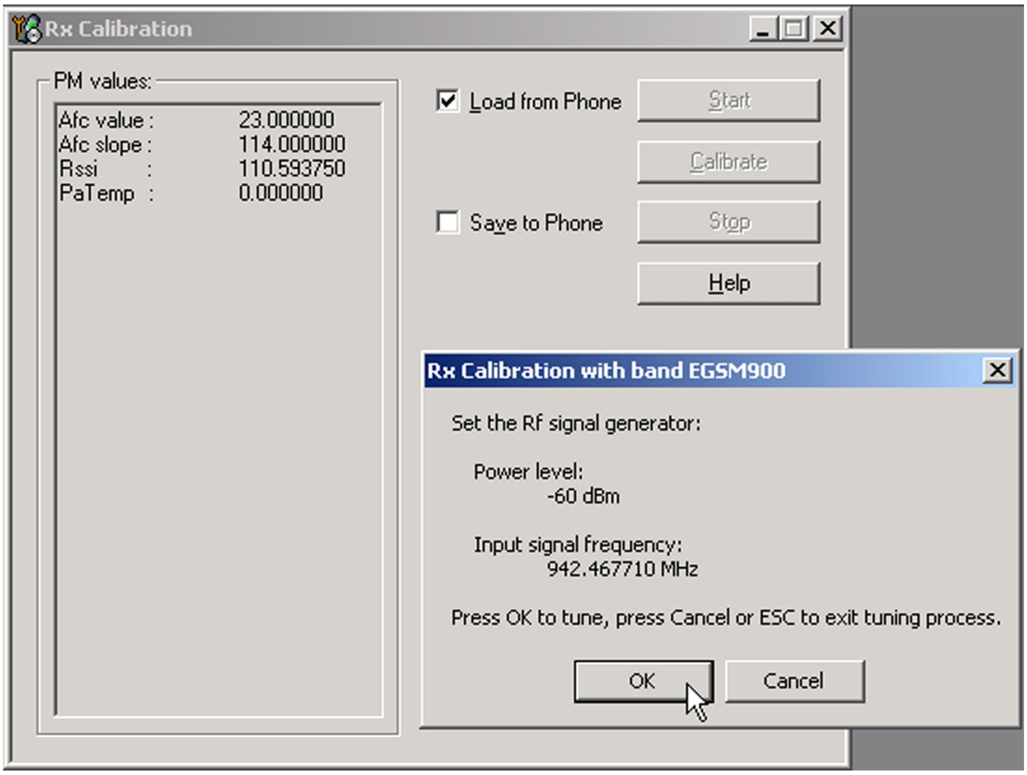


Rx Calibration
PM values:
☑ Load from Phone
☐ Save to Phone
Start
Calibrate
Stop
Help

Afc value : 23.000000
Afc slope : 114.000000
Rssi : 110.593750
PaTemp : 0.000000

9. Connect the signal generator to the phone, and set frequency and amplitude as instructed in the **Rx Calibration with band EGSM900** pop-up window.

   Important: The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation.



PM values:

Afc value : 23.000000
Afc slope : 114.000000
Rssi : 110.593750
PaTemp : 0.000000

☑ Load from Phone

☐ Save to Phone

Rx Calibration with band EGSM900

Set the Rf signal generator:

Power level:
-60 dBm

Input signal frequency:
942.467710 MHz

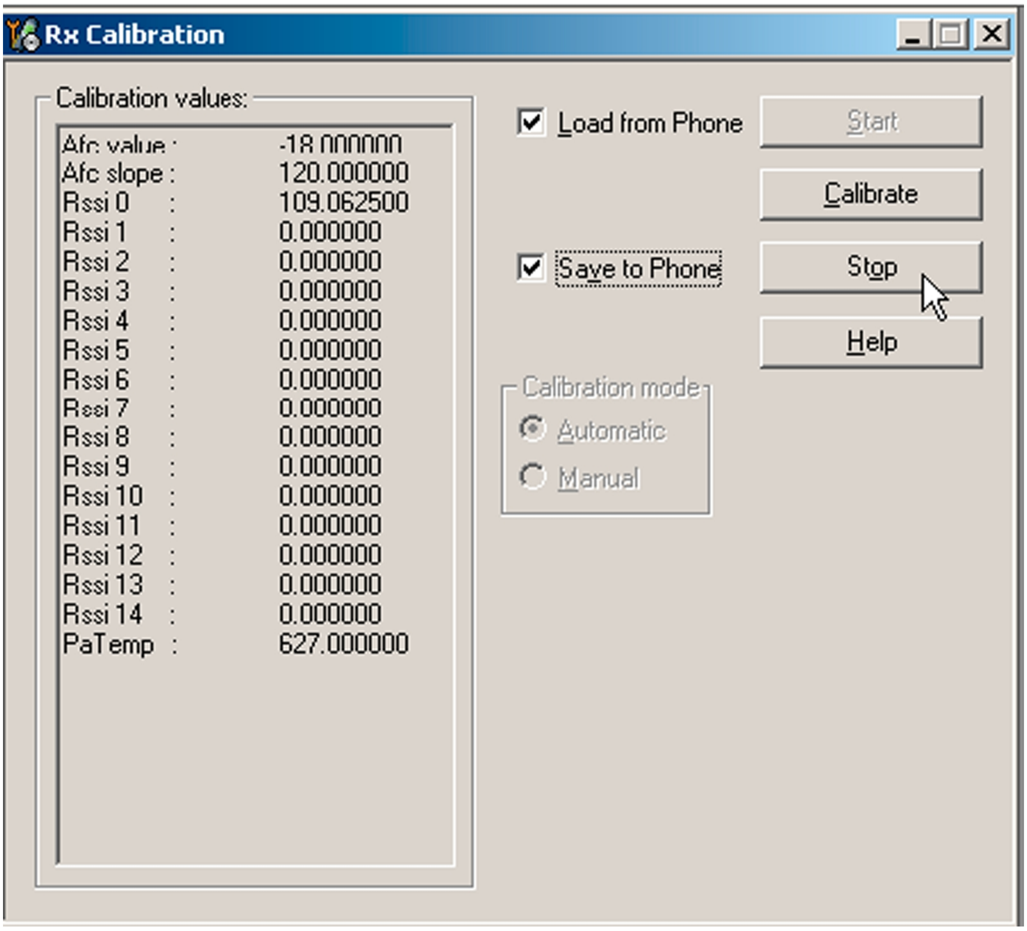
Press OK to tune, press Cancel or ESC to exit tuning process.

10. To perform the tuning, click **OK**.
11. Check that the tuning values are within the limits specified in the following table:

Table 11 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM900				
AFC Value	-200	-105...62	200	
AFC slope	0	122	200	
RSSI0	106	107...110	114	dB
GSM1800				
RSSI0	104	104...109	114	dB
GSM1900				
RSSI0	104	104...109	114	dB

12. To save values to the phone, check the **Save to Phone** check box, and click **Stop**.



Calibration values:

```
Afc value :      -18.000000
Afc slope :      120.000000
Rssi 0    :      109.062500
Rssi 1    :      0.000000
Rssi 2    :      0.000000
Rssi 3    :      0.000000
Rssi 4    :      0.000000
Rssi 5    :      0.000000
Rssi 6    :      0.000000
Rssi 7    :      0.000000
Rssi 8    :      0.000000
Rssi 9    :      0.000000
Rssi 10   :      0.000000
Rssi 11   :      0.000000
Rssi 12   :      0.000000
Rssi 13   :      0.000000
Rssi 14   :      0.000000
PaTemp    :      627.000000
```

☑ Load from Phone

☑ Save to Phone

● Automatic

○ Manual

Next actions

Repeat steps 3 to 8 for GSM1800 and GSM1900

Rx band filter response compensation (GSM)

Prerequisites

Rx calibration must be done before the Rx Band Filter Response Compensation

Context

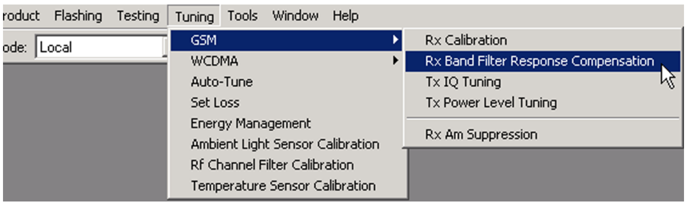
In each GSM Rx band, there’s a band pass filter in front of RF ASIC front end. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

The calibration has to be repeated for each GSM band.

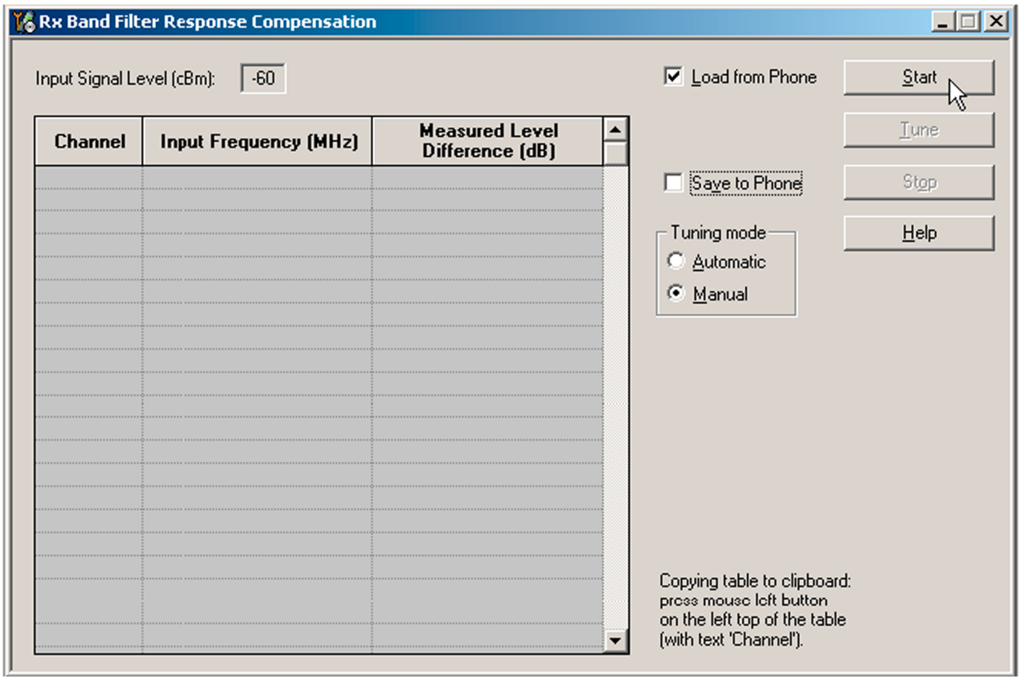
Steps

1. Connect module jig’s GSM connector to signal generator.
2. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.

3. From the Tuning menu, choose GSM -> Rx Band Filter Response Compensation.


roduct
Flashing
Testing
Tuning
Tools
Window
Help
ode: Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

4. Check “Manual” and “Load from Phone” check boxes. Clear “Save to Phone” check box
5. Click Start.


Rx Band Filter Response Compensation
Start
Tune
Stop
Help
Tuning mode

Input Signal Level (cBm): -60

Channel	Input Frequency (MHz)	Measured Level Difference (dB)

☑ Load from Phone

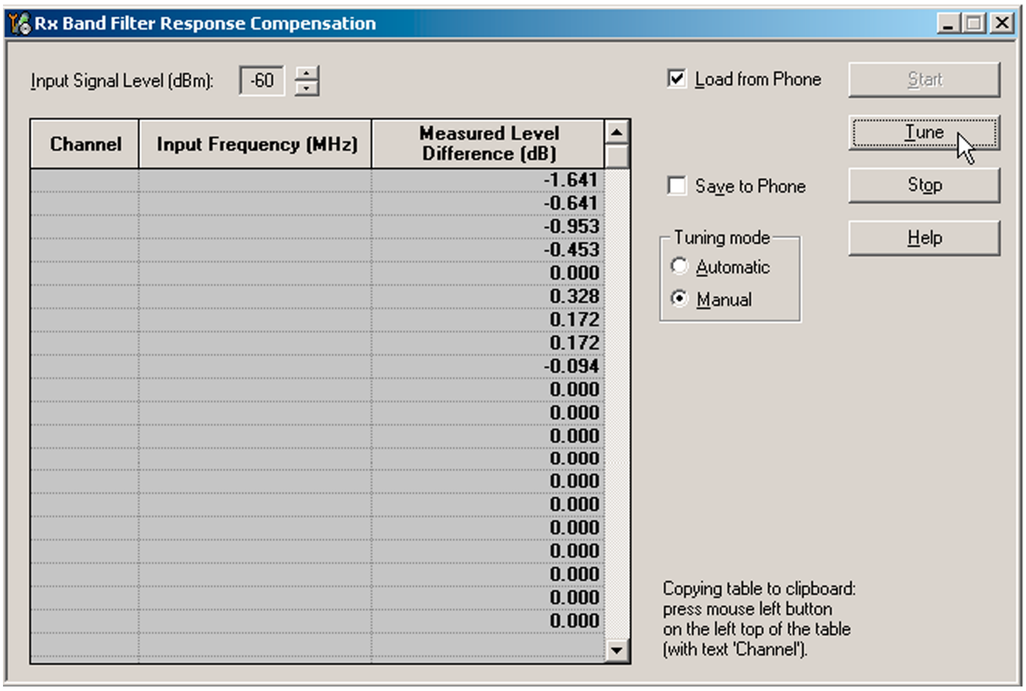
☐ Save to Phone

○ Automatic

● Manual

Copying table to clipboard:
press mouse left button
on the left top of the table
(with text 'Channel').

6. Click Tune.


Rx Band Filter Response Compensation
Start
Tune
Stop
Help

Input Signal Level (dBm): -60

☑ Load from Phone

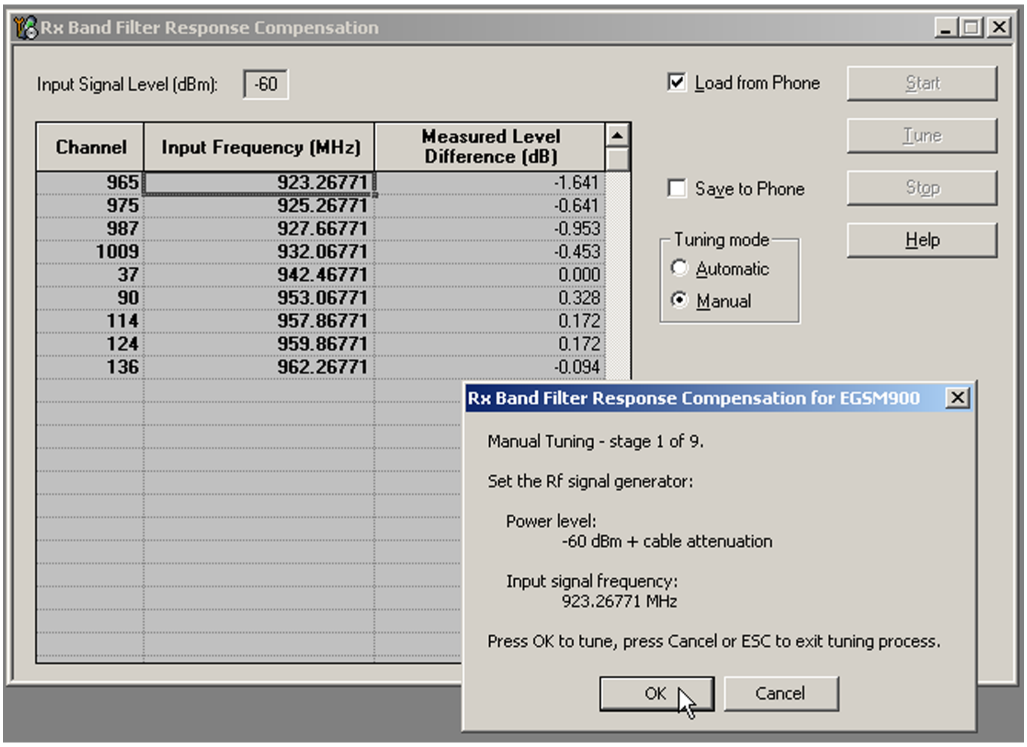
☐ Save to Phone

Tuning mode
○ Automatic
● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
		-1.641
		-0.641
		-0.953
		-0.453
		0.000
		0.328
		0.172
		0.172
		-0.094
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000
		0.000

Copying table to clipboard: press mouse left button on the left top of the table (with text 'Channel').

7. Connect signal generator to the phone and set frequency and amplitude as instructed in the "Rx Band Filter Response Compensation for EGSM900" popup window.


Rx Band Filter Response Compensation
Start
Tune
Stop
Help
Rx Band Filter Response Compensation for EGSM900
OK
Cancel

Input Signal Level (dBm): -60

☑ Load from Phone

☐ Save to Phone

Tuning mode
○ Automatic
● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
965	923.26771	-1.641
975	925.26771	-0.641
987	927.66771	-0.953
1009	932.06771	-0.453
37	942.46771	0.000
90	953.06771	0.328
114	957.86771	0.172
124	959.86771	0.172
136	962.26771	-0.094

Manual Tuning - stage 1 of 9.

Set the Rf signal generator:

Power level:
-60 dBm + cable attenuation

Input signal frequency:
923.26771 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

8. To perform tuning, click OK.

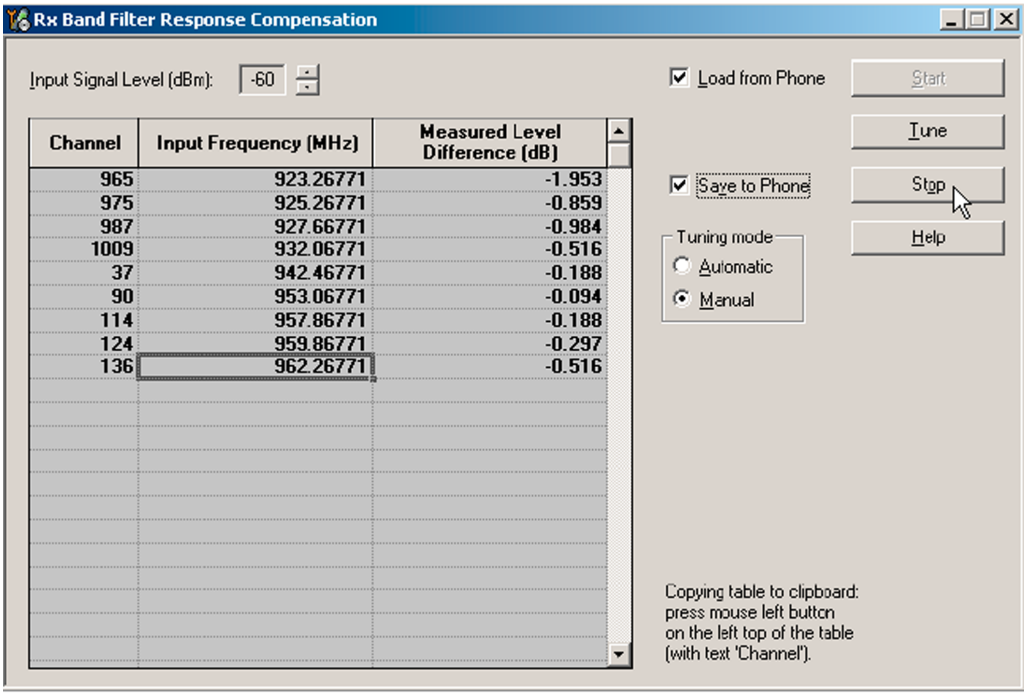
9. Go through all 9 frequencies.

10. Check that the tuning values are within the limits specified in this table:

	Min	Typ	Max	Unit
GSM900				
Ch. 965 / 923.26771 MHz	-10	-1	5	dB
Ch. 975 / 925.26771 MHz	-3	0	5	dB
Ch. 987 / 927.66771 MHz	-3	0	5	dB
Ch. 1009 / 932.06771 MHz	-3	0	5	dB
Ch. 37 / 942.46771 MHz	-3	0	5	dB
Ch. 90 / 953.06771 MHz	-3	0	5	dB
Ch. 114 / 957.86771 MHz	-3	0	5	dB
Ch. 124 / 959.86771 MHz	-3	0	5	dB
Ch. 136 / 962.26771 MHz	-10	-1	5	dB
GSM1800				
Ch. 497 / 1802.26771 MHz	-10	-1	5	dB
Ch. 512 / 1805.26771 MHz	-3	0	5	dB
Ch. 535 / 1809.86771 MHz	-3	0	5	dB
Ch. 606 / 1824.06771 MHz	-3	0	5	dB
Ch. 700 / 1842.86771 MHz	-3	0	5	dB
Ch. 791 / 1861.06771 MHz	-3	0	5	dB
Ch. 870 / 1876.86771 MHz	-3	0	5	dB
Ch. 885 / 1879.86771 MHz	-3	0	5	dB
Ch. 908 / 1884.46771 MHz	-10	-1	5	dB
GSM1900				

	Min	Typ	Max	Unit
Ch. 496 / 1927.06771 MHz	-10	-1	5	dB
Ch. 512 / 1930.26771 MHz	-3	0	5	dB
Ch. 537 / 1935.26771 MHz	-3	0	5	dB
Ch. 586 / 1945.06771 MHz	-3	0	5	dB
Ch. 661 / 1960.06771 MHz	-3	0	5	dB
Ch. 736 / 1975.06771 MHz	-3	0	5	dB
Ch. 794 / 1986.66771 MHz	-3	0	5	dB
Ch. 810 / 1989.86771 MHz	-3	0	5	dB
Ch. 835 / 1994.86771 MHz	-10	-1	5	dB

11. Check the "Save to Phone" check box and click Stop if the values are within the limits.



Input Signal Level (dBm): -60

☑ Load from Phone

☑ Save to Phone

○ Automatic

● Manual

Channel	Input Frequency (MHz)	Measured Level Difference (dB)
965	923.26771	-1.953
975	925.26771	-0.859
987	927.66771	-0.984
1009	932.06771	-0.516
37	942.46771	-0.188
90	953.06771	-0.094
114	957.86771	-0.188
124	959.86771	-0.297
136	962.26771	-0.516

Copying table to clipboard: press mouse left button on the left top of the table (with text 'Channel').

Next actions

Repeat the steps 4 to 10 for GSM1800 and GSM1900.

GSM transmitter tunings

Tx IQ tuning (GSM)

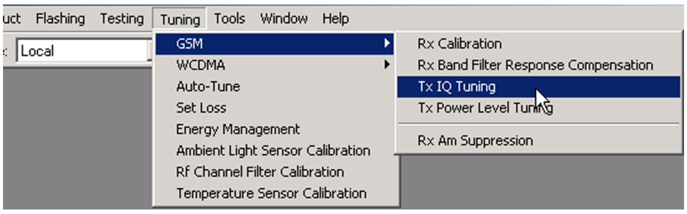
Context

The Tx path branches to I and Q signals at RF I/Q modulator. Modulator and analog hardware located after it cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning tuning balances the I and Q branches.

Tx IQ tuning must be performed on all GSM bands. .

Steps

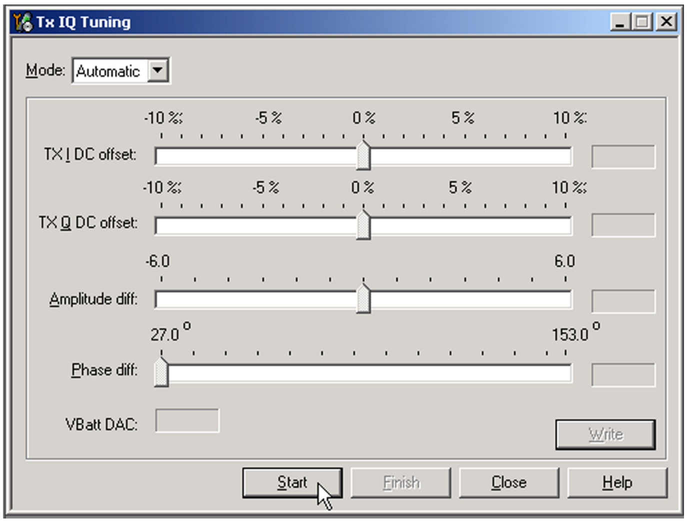
1. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.
2. From the Tuning menu, choose GSM -> Tx IQ Tuning.


uct
Flashing
Testing
Tuning
Tools
Window
Help
Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

3. Set Mode to Automatic and Edge to Off.
4. Click Start.

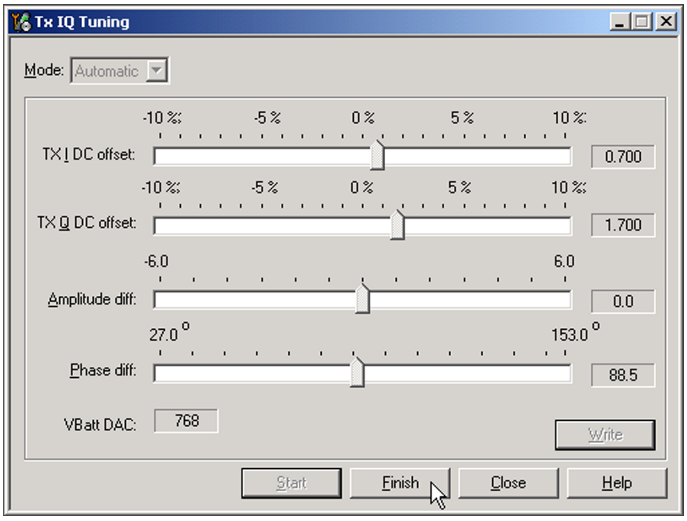
   Wait until automatic tuning has finished and moved the sliders.

   Values are written to the phone memory automatically.


Tx IQ Tuning
-10 %
-5 %
0 %
5 %
10 %
TX I DC offset:
-10 %
-5 %
0 %
5 %
10 %
TX Q DC offset:
-6.0
6.0
Amplitude diff:
27.0 °
153.0 °
Phase diff:
VBatt DAC:
Write
Start
Finish
Close
Help

Mode: Automatic

5. When the values have been written to the phone memory, click the Finish button to end the tuning.



Mode: Automatic
TX I DC offset: 0.700
TX Q DC offset: 1.700
Amplitude diff: 0.0
Phase diff: 88.5
VBatt DAC: 768

6. Change band to GSM1800 and repeat steps 4 to 5.
7. Change band to GSM1900 and repeat steps 4 to 5.
8. To close the tuning window, click Close.

Next actions

Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the table below. If they are not within the limits, check Tx IQ quality manually.

	Min	Typ	Max	Unit
GSM900				
I DC offset / Q DC offset	-6	0	6	%
Ampl	-1	0	1	dB
Phase	85	90	95	○
GSM1800/GSM1900				
I/Q DC	-6	0	6	%
Ampl	-1	0	1	dB
Phase	86	95	105	○

Tx power level tuning (GSM)

Context

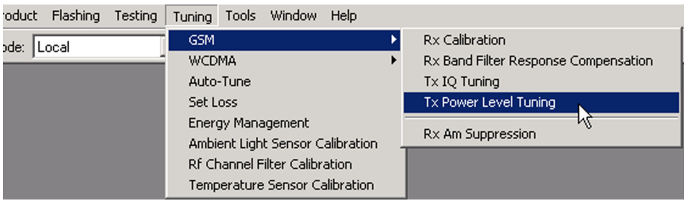
Because of variations at IC process and discrete component values, actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

For EDGE transmission the bias settings of the FEM are adjusted in order to improve linearity. This affects the PA gain and hence the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

1. Connect the phone to a spectrum analyzer.
2. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.
3. From the Tuning menu, choose GSM -> Tx Power Level Tuning.

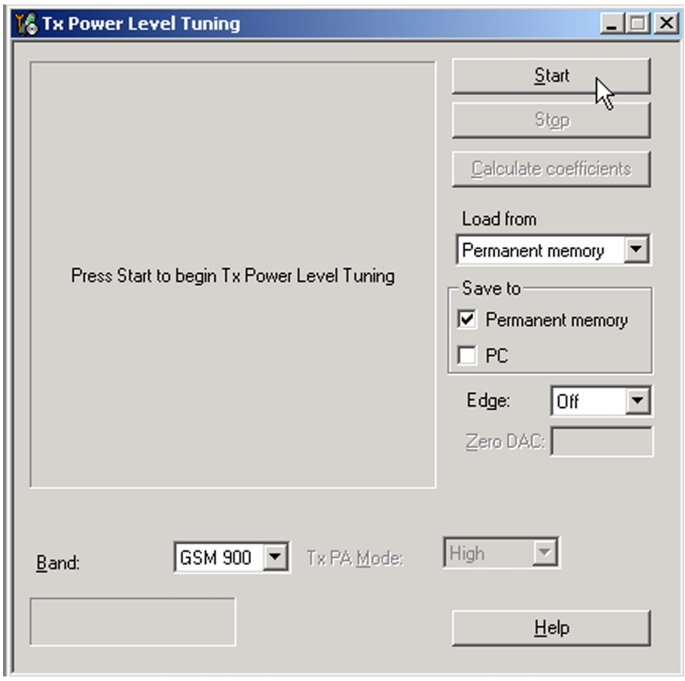

roduct
Flashing
Testing
Tuning
Tools
Window
Help
ode: Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
Rf Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

4. Set Mode to Automatic and Edge to Off.
5. Set the spectrum analyzer for power level tuning:

Frequency	channel frequency (897.4MHz GSM900, 1747.8MHz GSM1800, 1880MHz GSM1900)
Span	0 Hz
Sweep time	2ms
Trigger	Video triggering (-10dBm)
Resolution BW	3MHz
Video BW	3MHz
Reference level offset	sum cable attenuation with module jig attenuation
Reference level	33dBm

A power meter with a peak power detector can be also used. Remember to take the attenuations in the account!

6. Click Start.


Tx Power Level Tuning
Start
Stop
Calculate coefficients
Help

Press Start to begin Tx Power Level Tuning

Load from: Permanent memory

Save to:
☑ Permanent memory
☐ PC

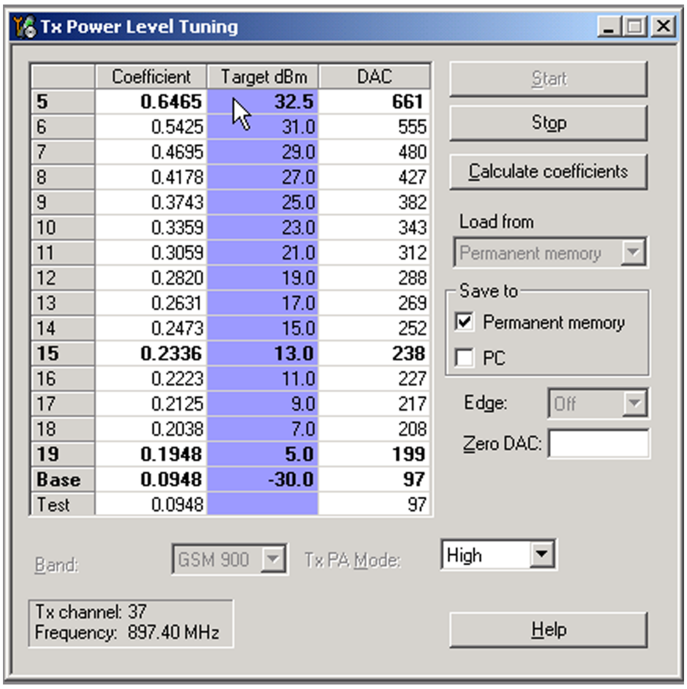
Edge: Off

Zero DAC:

Band: GSM 900

Tx PA Mode: High

7. Adjust power levels 5, 15 and 19 to correspond the "Target dBm" column by pressing + or – keys.


Tx Power Level Tuning
Start
Stop
Calculate coefficients
Help

	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory

Save to:
☑ Permanent memory
☐ PC

Edge: Off

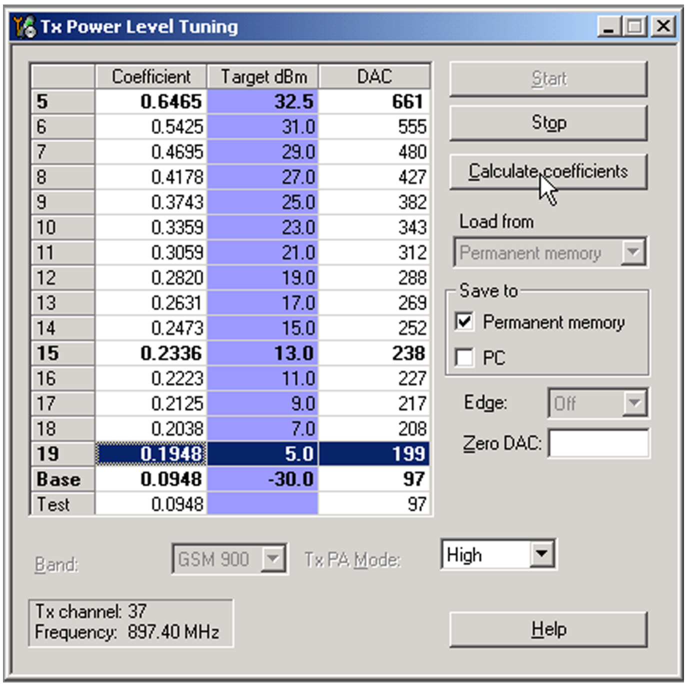
Zero DAC:

Band: GSM 900

Tx PA Mode: High

Tx channel: 37
Frequency: 897.40 MHz

8. Click Calculate Coefficients.



	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory

Save to
☑ Permanent memory
☐ PC

Edge: Off

Zero DAC:

Band: GSM 900

Tx PA Mode: High

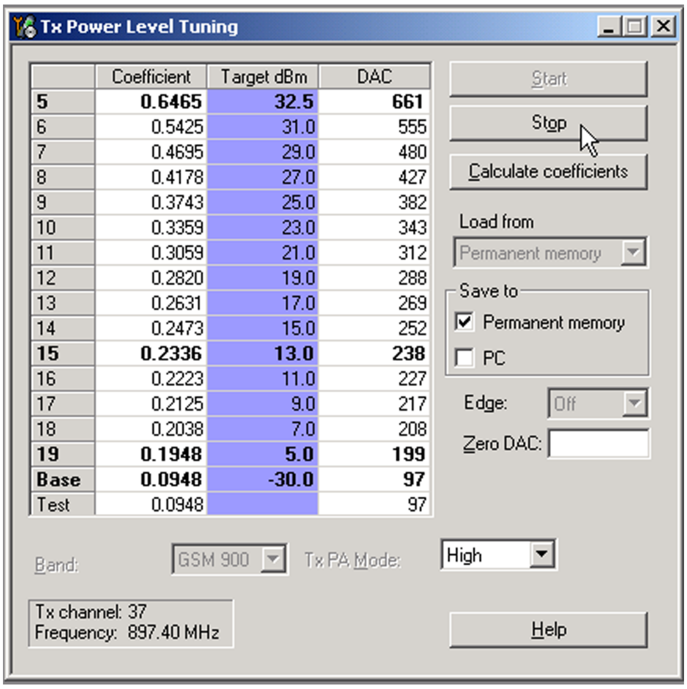
Tx channel: 37
Frequency: 897.40 MHz

9. Check that the coeffiecient values are within the limits specified in the following table.

	Min	Typ	Max
GSM900 EDGE off			
PL5 coefficient	0.45	0.698	0.78
PL15 coefficient		0.252	
PL19 coefficient	0.12	0.200	0.3
GSM900 EDGE on			
PL8 coefficient	0.35	0.510	0.6
PL15 coefficient		0.277	
PL19 coefficient	0.12	0.218	0.3
GSM1800 EDGE off			
PL0 coefficient	0.45	0.659	0.75
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.194	0.3
GSM1800 EDGE on			
PL2 coefficient	0.35	0.544	0.62
PL11 coefficient		0.257	
PL15 coefficient	0.12	0.218	0.3
GSM1900 EDGE off			
PL0 coefficient	0.45	0.67	0.75

	Min	Typ	Max
PL11 coefficient		0.226	
PL15 coefficient	0.12	0.191	0.3
GSM1900 EDGE on			
PL2 coefficient	0.35	0.548	0.62
PL11 coefficient		0.256	
PL15 coefficient	0.12	0.216	0.3

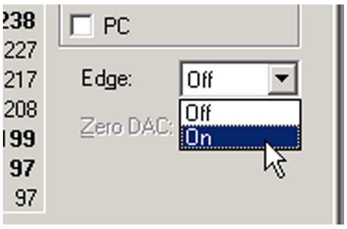
If the values are within the limits, check that the "Save to Phone Permanent Memory" check box is checked and click Stop.



	Coefficient	Target dBm	DAC
5	**0.6465**	**32.5**	**661**
6	0.5425	31.0	555
7	0.4695	29.0	480
8	0.4178	27.0	427
9	0.3743	25.0	382
10	0.3359	23.0	343
11	0.3059	21.0	312
12	0.2820	19.0	288
13	0.2631	17.0	269
14	0.2473	15.0	252
15	**0.2336**	**13.0**	**238**
16	0.2223	11.0	227
17	0.2125	9.0	217
18	0.2038	7.0	208
19	**0.1948**	**5.0**	**199**
Base	**0.0948**	**-30.0**	**97**
Test	0.0948		97

Load from: Permanent memory
Save to:
☑ Permanent memory
☐ PC
Edge: Off
Zero DAC:
Band: GSM 900
Tx PA Mode: High
Tx channel: 37
Frequency: 897.40 MHz

10. Set **Edge** mode on and start tuning again. Change video averaging to 50.



☐ PC
Edge: Off
Off
On

11. Tune EDGE power levels to the corresponding target power levels.

    Only power levels **8**, **15** and **19** are tuned in GSM900 and **2**, **10** and **15** in GSM1800/1900. The rest are calculated by clicking the Calculate Coefficients button. Check the coefficients against the RF tuning limits table presented in Step 9.
12. When the tuning is completed, click Stop.

Next actions

Repeat steps 4 to 9 for GSM1800 and GSM1900. On those bands only power levels **0**, **11** and **15** need to be tuned.

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8 — Camera Module Troubleshooting

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Camera construction........8–10
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Introduction to camera module troubleshooting

Background, tools and terminology

Faults or complaints in camera operation can be roughly categorised into three subgroups:

1. Camera is not functional at all; no image can be taken.
2. Images can be taken but there is nothing recognizable in them.
3. Images can be taken and they are recognizable but for some reason the quality of images is seriously degraded.

Image quality is very hard to measure quantitatively, and even comparative measurements are difficult (comparing two images) to do, if the difference is small. Especially if the user is not satisfied with his/her device's image quality, and tells, for example, that the images are not sharp, it is fairly difficult to accurately test the device and get an exact figure which would tell whether the device is functioning properly.

Often subjective evaluation has to be used for finding out if a certain property of the camera is acceptable or not. Some training or experience of a correctly operating reference device may be needed in order to detect what actually is wrong.

It is easy for the user to take bad images in bad conditions. Therefore the camera operation has to be checked always in constant conditions (lighting, temperature) or by using a second, known-to-be good device as reference.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems may be expected to appear:

- Dust (black spots)
- Lack of sharpness
- Bit errors

Terms

Dynamic range	Camera's ability to capture details in dark and bright areas of the scene simultaneously.
Exposure time	Camera modules use silicon sensor to collect light and for forming an image. The imaging process roughly corresponds to traditional film photography, in which exposure time means the time during which the film is exposed to light coming through optics. Increasing the time will allow for more light hitting the film and thus results in brighter image. The operation principle is exactly the same with silicon sensor, but the shutter functionality is handled electronically i.e. there is no mechanical moving parts like in film cameras.
Flicker	Phenomenon, which is caused by pulsating in scene lighting, typically appearing as wide horizontal stripes in an image.
Noise	Variation of response between pixels with same level of input illumination.
Resolution	Usually the amount of pixels in the camera sensor; for example, RM-38 has a camera with 1600 x 1200 pixel sensor resolution. In some occasions the term resolution is used for describing the sharpness of the images.

Sensitivity	Camera module's sensitivity to light. In equivalent illumination conditions, a less sensitive camera needs a longer exposure time to gather enough light in forming a good image. Analogous to ISO speed in photographic film.
Sharpness	Good quality images are 'sharp' or 'crisp', meaning that image details are well visible in the picture. However, certain issues, such as non-idealities in optics, cause image blurring, making objects in picture to appear 'soft'. Each camera type typically has its own level of performance.

The effect of image taking conditions on image quality

There are some factors, which may cause poor image quality, if not taken into account by the end user when shooting images, and thus may result in complaints. The items listed are normal to camera operation and are not a reason for changing the camera module.

Distance to target

The lens in the module is specified to operate satisfactorily from 40 cm to infinite distance of scene objects. In practice, the operation is such that close objects may be noticed to get more blurred when distance to them is shorter than 40 cm. The lack of sharpness is first visible in full resolution images. If observing just the viewfinder, even very close objects may seem to appear sharp. This is normal; do not change the camera module.

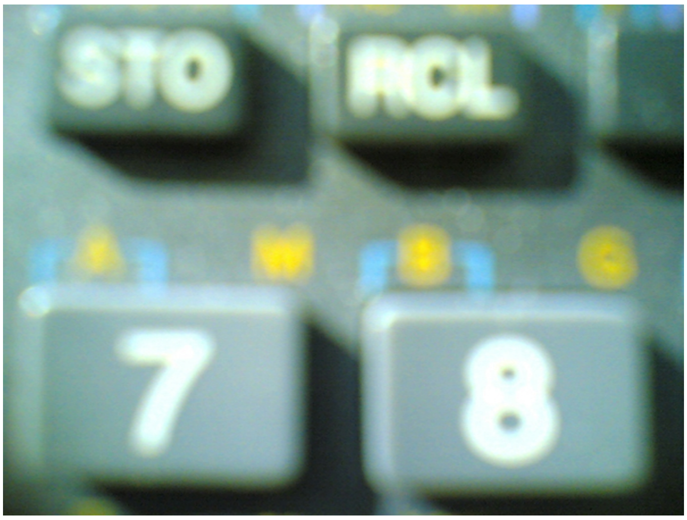


Figure 53 Blurred image. Target too close.

The amount of light available

In dim conditions camera runs out of sensitivity. The exposure time is long (especially in the night mode) and the risk of getting shaken (= blurred) images increases. In addition, image noise level grows. The maximum exposure time in the night mode is ¼ seconds. Therefore, images need to be taken with extreme care and by supporting the phone when the amount of light reflected from the target is low. Because of the longer exposure time and larger gain value, noise level increases in low light conditions. Sometimes blurring may even occur in daytime, if the image is taken very carelessly. See the figure below for an example. This is normal; do not change the camera module.

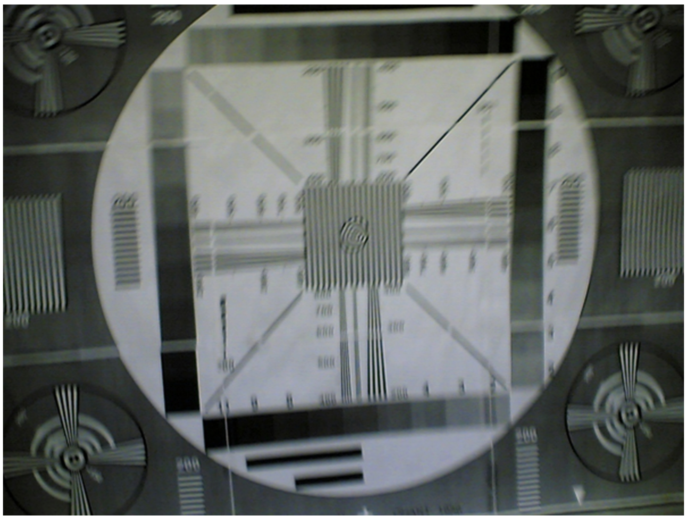


Figure 54 Blurring caused by shaking hands

Movement in bright light

If an image is taken of moving objects or if the device is used in a moving vehicle, object 'skewing' or 'tilting' may occur. This phenomenon is fundamental to most CMOS camera types, and usually cannot be avoided. The movement of camera or object sometimes cause blurring indoors or in dim lighting conditions because of long exposure time. This is normal; do not change the camera module.

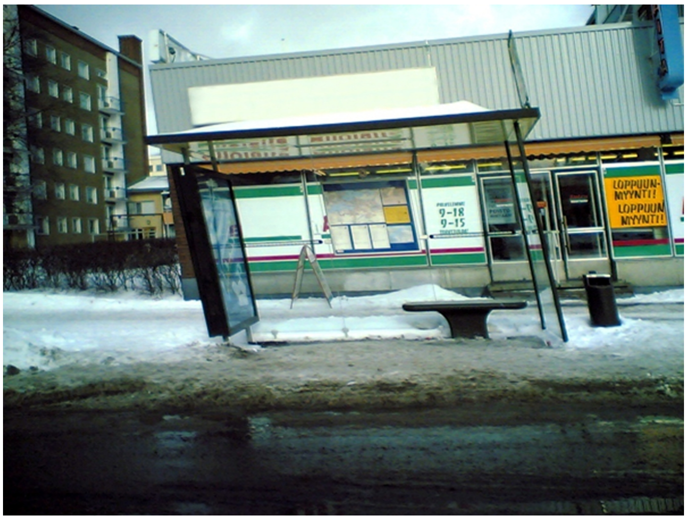


Figure 55 Near objects get skewed when taking images from a moving vehicle

Temperature

High temperatures inside the mobile phone cause more noise to appear in images. For example, in +70 degrees (Celsius), the noise level may be very high, and it further grows if the conditions are dim. If the phone processor has been heavily loaded for a long time before taking an image, the phone might have considerably higher temperature inside than in the surrounding environment. This is also normal to camera operation; do not change the camera module.

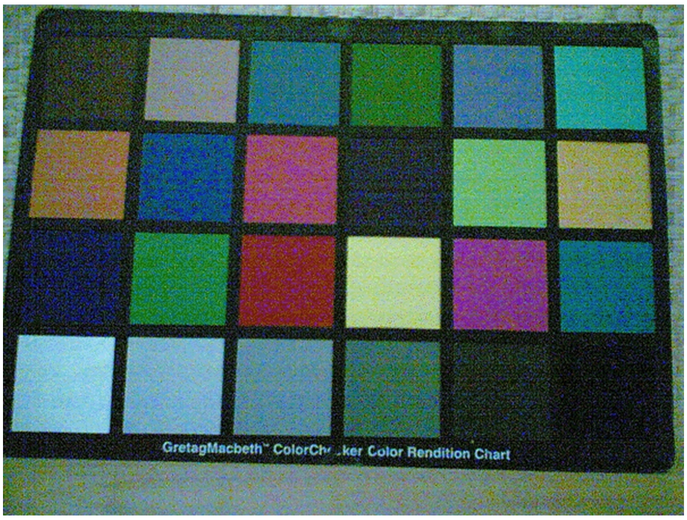


Figure 56 Noisy image taken in +70 degrees Celsius

Phone display

If the display contrast is set too dark, the image quality degrades: the images may be very dark depending on the setting. If the display contrast is set too bright, image contrast appears bad and "faint". This problem is solved by setting the display contrast correctly. This is normal behaviour; do not change the camera module.

Basic rules of photography (especially shooting against light)

Because of dynamic range limitations, taking images against bright light might cause either saturated image or the actual target appear too dark. In practice, this means that when taking an image indoors and having, for example, a window behind the object, the result is usually poor. This is normal behaviour; do not change the camera module.

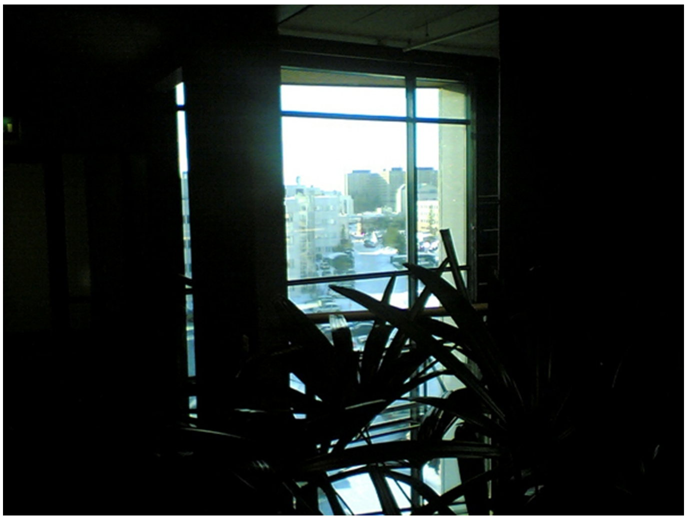


Figure 57 Image taken against light

Flicker

In some occasions a bright fluorescent light may cause flicker in the viewfinder and captured image. This phenomenon may also be a result, if images are taken indoors under the mismatch of 50/60 Hz electricity network frequency. The electricity frequency used is automatically detected by the camera module. In some very few countries, both 50 and 60 Hz networks are present and thus probability for the phenomenon increases. Flickering occurs also under high artificial illumination level. This is normal behaviour; do not change the camera module.

Figure 58 Flicker in an image; object illuminated by strong fluorescent light

Bright light outside of image view

Especially the sun can cause clearly visible lens glare phenomenon and poor contrast in images. This happens because of undesired reflections inside the camera optics. Generally this kind of reflections are common in all optical systems. This is normal behaviour; do not change the camera module.

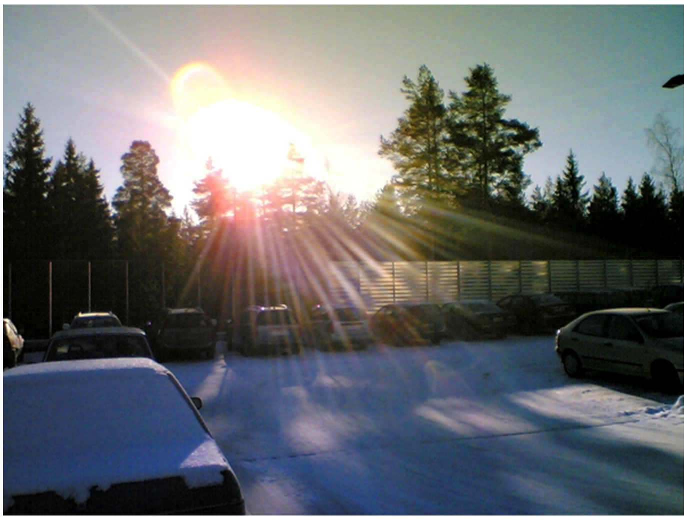


Figure 59 A lens reflection effect caused by sunshine

Examples of good quality images

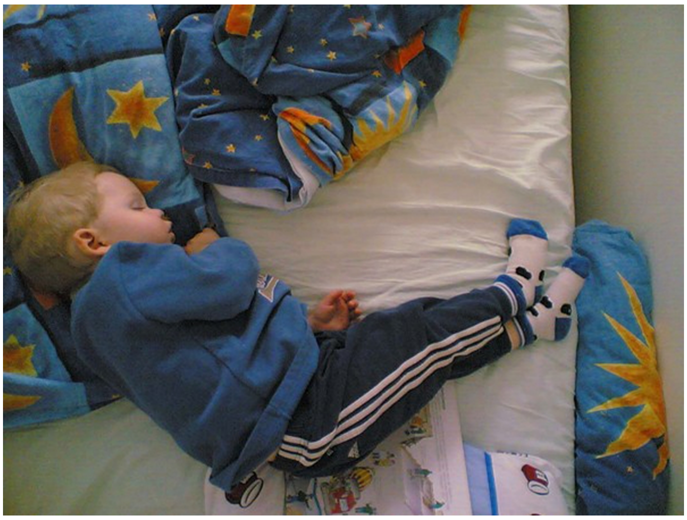


Figure 60 Good image taken indoors

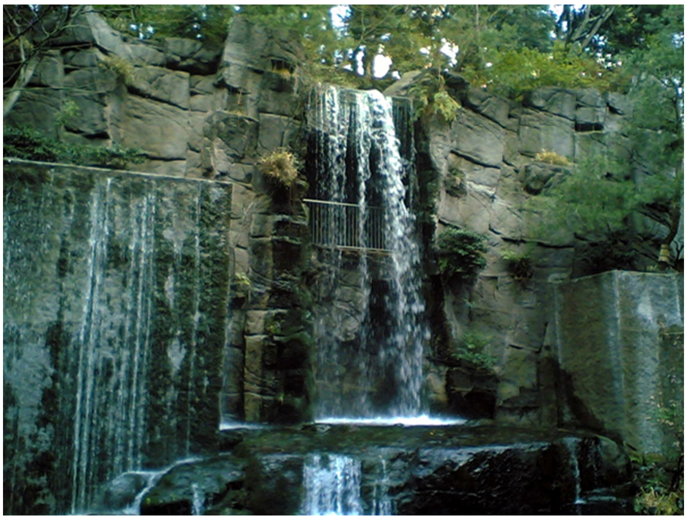


Figure 61 Good image taken outdoors

■ Camera construction

This section describes the mechanical construction of the camera module for getting a better understanding of the actual mechanical structure of the module.

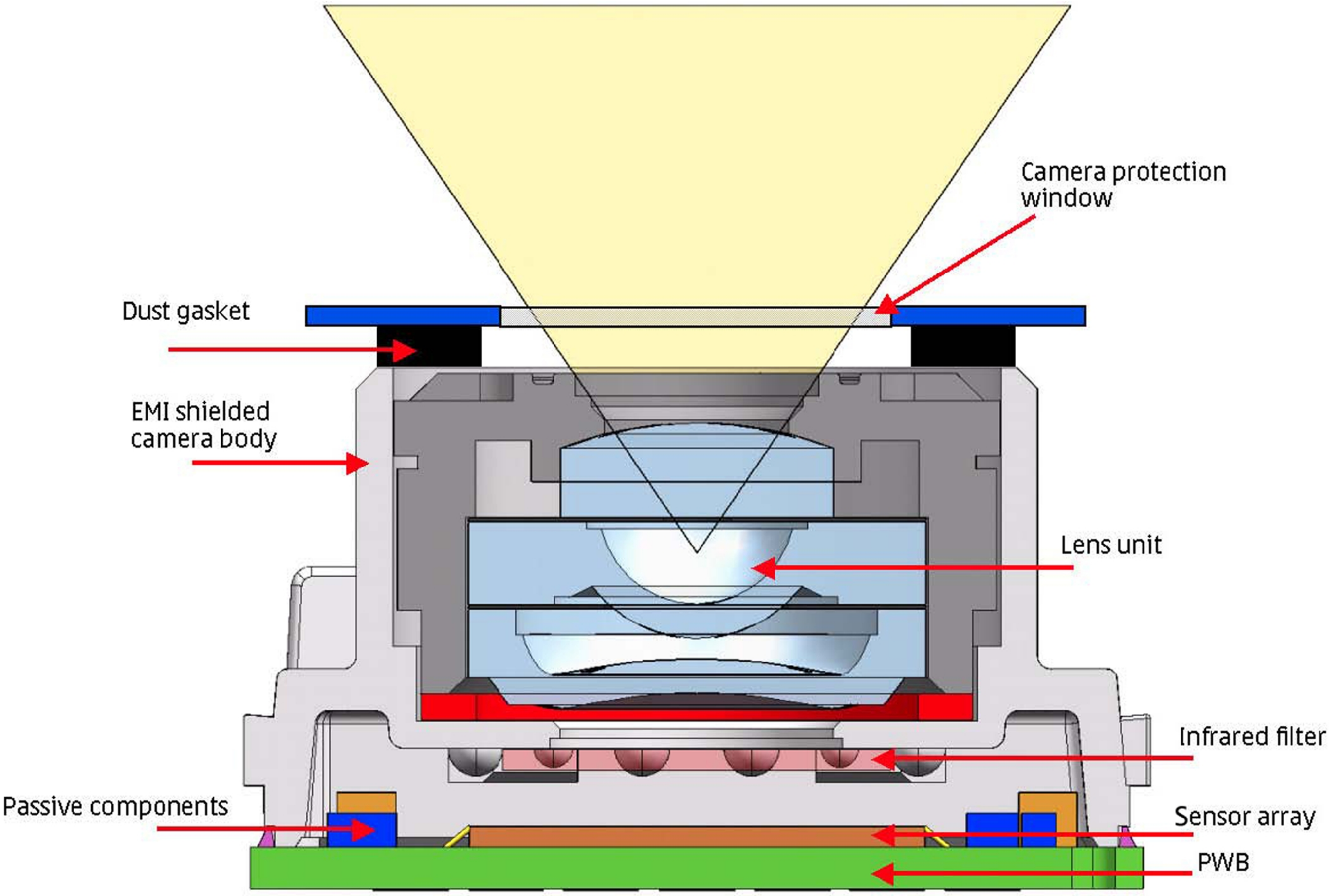

Camera protection window
Dust gasket
EMI shielded camera body
Lens unit
Infrared filter
Passive components
Sensor array
PWB

Figure 62 Camera module cross section and assembly principle

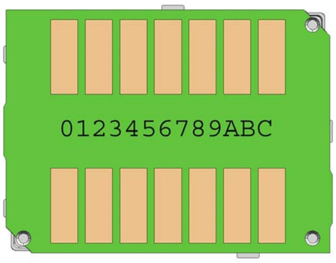

0123456789ABC

Figure 63 Camera module bottom view including serial numbering

The camera module as a component is not a repairable part, meaning that the components inside the module may not be changed. Cleaning dust from the front face is allowed only. Use clean compressed air.

The camera module uses socket type connecting. For versioning, laser marked serial numbering is used on the PWB.

The main parts of the module are:

- Lens unit including lens aperture.
- Infrared filter; used to prevent infrared light from contaminating the image colors. The IR filter is glued to the EMI shielded camera body.
- Camera body; made of conductive metallized plastic and attached to the PWB with glue.
- Sensor array including DSP functions is glued and wire-bonded to the PWB.
- PWB, FR-4 type
- Socket type connection

- Laser-marked serial numbering on PWB (for versioning)
- Passive components
- Camera protection window; part of the phone cover mechanics
- Dust gasket between the lens unit and camera protection window

Image quality analysis

Testing for dust in camera module

Symptoms and diagnosis

For detecting dust problems, take an image of a uniform white surface and analyse it in full resolution. A good quality PC CRT monitor is preferred for analysis (avoid using LCD). Search carefully because finding these defects is not always easy. Figure "Effects of dust on optical path" is an example of an image having easily detectable dust problems.

When taking a white image, use uniformly lightened white paper or white wall. Another option is to use uniform light but in this case make sure that the camera image is not flickering when taking the test image. In case flickering occurs, try to reduce the illumination level. Use JPEG image format for analysing, and set the image quality parameter to ‘High Quality’.

Black spots in an image are caused by dirt particles trapped inside the optical system. Clearly visible and sharp edged black dots in an image are typically dust particles on the image sensor. These spots are searched for in the manufacturing phase, but it is possible that the camera body cavity contains a particle, which may move onto the image sensor active surface, for example, when the phone is dropped. Therefore it is also possible that the problem will disappear before the phone is brought to service. The camera should be replaced if the problem is present when the service technician analyses the phone.

If dust particles are lying on the infrared filter surface on either side, they are hard to locate because they are out of focus, and appear in the image as large, grayish and fading-edge 'blobs'. Sometimes they are invisible to the eye, and the user probably does not notice them at all. However, it is possible that a larger particle disturbs the user, causing need for service.

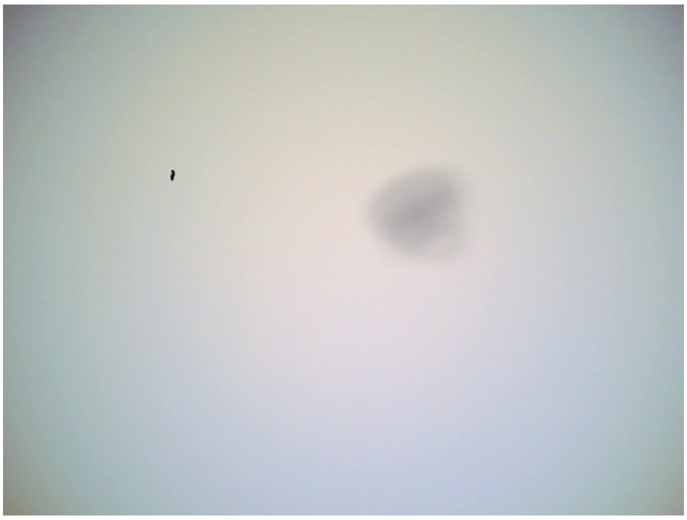


Figure 64 Effects of dust on optical path

If large dust particles get trapped on top of the lens surface in the cavity between the camera window and the lens, they will cause image blurring and poor contrast. If dust stays on the camera module surface, camera cussion, camera bezel or window at assembling, dust may sneak into the optical system as the optical zoom or Auto focus lens moves back and forth. The camera cussion and bezel between the window and the lens unit or camera module should prevent any particles from getting into the cavity after the manufacturing phase.

If dust particles are found on the sensor, this is classified as a manufacturing error of the module, and the camera should be replaced. Any particles inside the cavity between the protection window and the lens have most probably been trapped there in the assembly phase at a Nokia factory. Unauthorized disassembling of the product can also be the root of the problem. However, in most cases it should be possible to remove the particle(s) by using clean compressed air. Never wipe the lens surface before trying compressed air; the possibility of damaging the lens is substantial. Always check the image sharpness after removing dust.

Testing camera image sharpness

Symptoms and diagnosis

If pictures taken with a device are claimed to be blurry, there are six possible sources for the problem:

1 The protection window is fingerprinted, soiled, dirty, visibly scratched or broken.

2 The photographed object is too close – the camera lens operates with distances from 40 cm to infinity. This is no cause to replace camera module.

3 User has tried to take pictures in too dark conditions, and images are blurred due to handshake or movement. This is no cause to replace camera module.

4 There is dirt between the protection window and camera lens.

5 The protection window is defective. This can be either a manufacturing failure or caused by the user. The window should be changed.

6 The camera lens is misfocused because of a manufacturing error.

A quantitative analysis of sharpness is very difficult to conduct in any other environment than optics laboratory. Therefore, subjective analysis should be used.

If no visible defects (items 1-4) are found, a couple of test images should be taken. Generally, a well-illuminated typical indoor scene can be used as a target. The main considerations are:

- The protection window has to be clean.
- The amount of light (300 – 600 lux (bright office lighting)) is sufficient.
- The scene should contain, for example, small objects for checking sharpness. Their distance should be 1 – 2 meters.
- If possible, compare the image to another image of the same scene, taken with a different device. Note that the reference device has to be a similar Nokia phone.

Steps

1. Take several images of small objects in the distance of 1-2 metres.
2. Analyse the images on a PC screen at 100% scaling with the reference images.

   Pay attention to the computer display settings: at least 65000 colors (16-bit) have to be used. True colour (24-bit, 16 million colours) or 32-bit (full colour) setting is recommended.

Next actions

If there appears to be a clearly noticeable difference between the reference image and the test images, the module might have a misfocused lens -> change the module.

Re-check the resolution after changing the camera module.

If the changed module produces the same result, the fault is probably in the camera window. Check the window by looking carefully through it when replacing the module.

Related information

- Testing for dust in camera module (page 8–12)

- Dirty camera protection window (page 8–14)

Dirty camera lens protection window

The following series of images demonstrates the effects of fingerprints on the camera protection window.

It should be noted that the effects of any dirt in images can vary much. It may be difficult to judge whether the window has been dirty or if something else is wrong. Therefore, the cleanness of the protection window should always be checked and the window should be wiped clean with a suitable cloth.

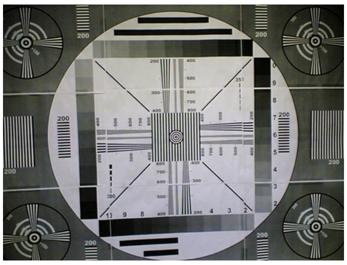
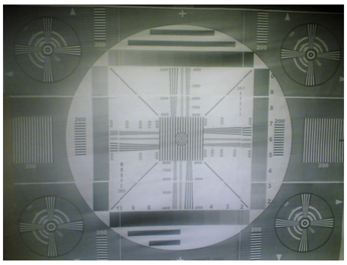
 **Figure 65 Image taken with clean protection window**	 **Figure 66 Image taken with greasy protection window**

Image bit errors

Bit errors are image defects caused by data transmission errors between the camera module and the phone baseband and/or errors inside the module.

Usually bit errors can be easily detected in images, and they are best visible in full resolution images. A good practice is to use a uniform white test target when analysing these errors. The errors are clearly visible, colourful sharp dots or lines in camera images. See the following figure.

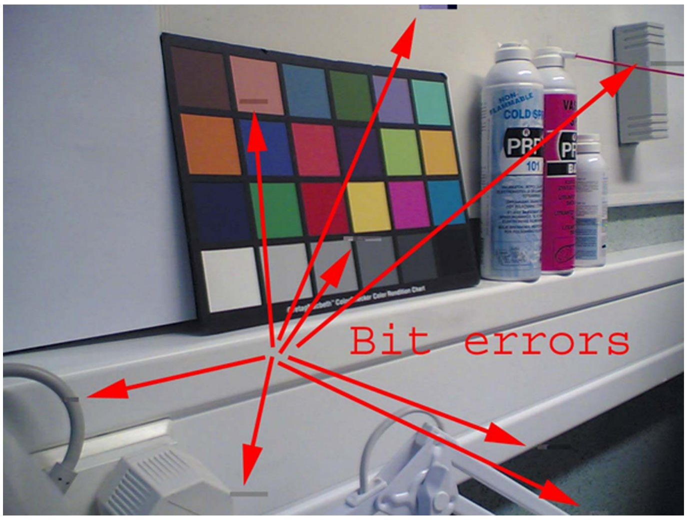


Figure 67 Bit errors caused by JPEG compression

One type of bit error is a lack of bit depth. In this case, the image is almost totally black under normal conditions, and only senses something in very highly illuminated environments. Typically this is a contact problem between the camera module and the phone main PWB. You should check the camera assembly and connector contacts.

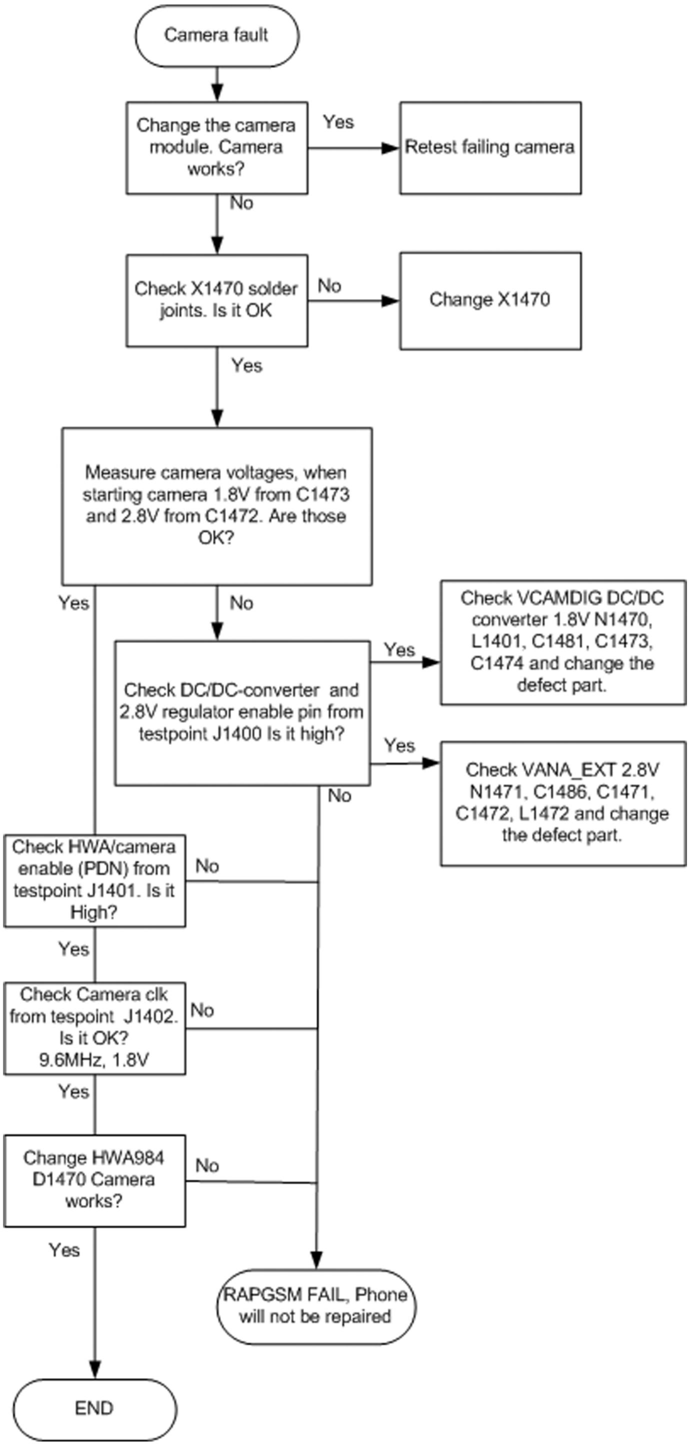
If the fault is in the camera module, bit errors are typically visible only when using some specific image resolution. For example, in case of a viewfinder fault, the error might exist but is not visible in a full size image.

> **Note:** At the most 5 clusters of black dots or blemish are not considered errors, and no reason to replace camera module

Camera troubleshooting flowchart

Camera hardware failure message troubleshooting

Troubleshooting flow


Camera fault
Change the camera module. Camera works?
Yes
Retest failing camera
No
Check X1470 solder joints. Is it OK
No
Change X1470
Yes
Measure camera voltages, when starting camera 1.8V from C1473 and 2.8V from C1472. Are those OK?
Yes
No
Check DC/DC-converter and 2.8V regulator enable pin from testpoint J1400 Is it high?
Yes
Check VCAMDIG DC/DC converter 1.8V N1470, L1401, C1481, C1473, C1474 and change the defect part.
Yes
Check VANA_EXT 2.8V N1471, C1486, C1471, C1472, L1472 and change the defect part.
No
Check HWA/camera enable (PDN) from testpoint J1401. Is it High?
No
Yes
Check Camera clk from tespoint J1402. Is it OK? 9.6MHz, 1.8V
No
Yes
Change HWA984 D1470 Camera works?
No
Yes
RAPGSM FAIL, Phone will not be repaired
END

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9 — System Module

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Baseband description

System module block diagram

RM-86 Transceiver is a monoblock phone consisting of Engine PWB, UI PWB and side key flex. Engine PWB consists of BB and RF modules. UI PWB consists of keyboard and illumination LEDs. Side key flex consists of PWR-key, side keys and two flashlight LEDs.

UI PWB is connected to the Engine PWB via 16-pin Board to Board connector. Side key flex is connected to Engine PWB via 12-pin Board to Board connector. GSM and BT antenna are connected to the Engine PWB via pogo pins.

RF, Baseband digital parts (processor & memory) and camera HWA are on the bottom side of the Engine PWB. EM ASICs, Bluetooth, FM Radio and 3D accelerometer are located on the top side. Accessories and charger can be connected via the Pop-Port connector and the charger connector. Display is connected to the top side of the Engine PWB.

Note: In this description, user interface HW (UI HW) covers accelerometer, display, camera, keyboard and keyboard backlight.

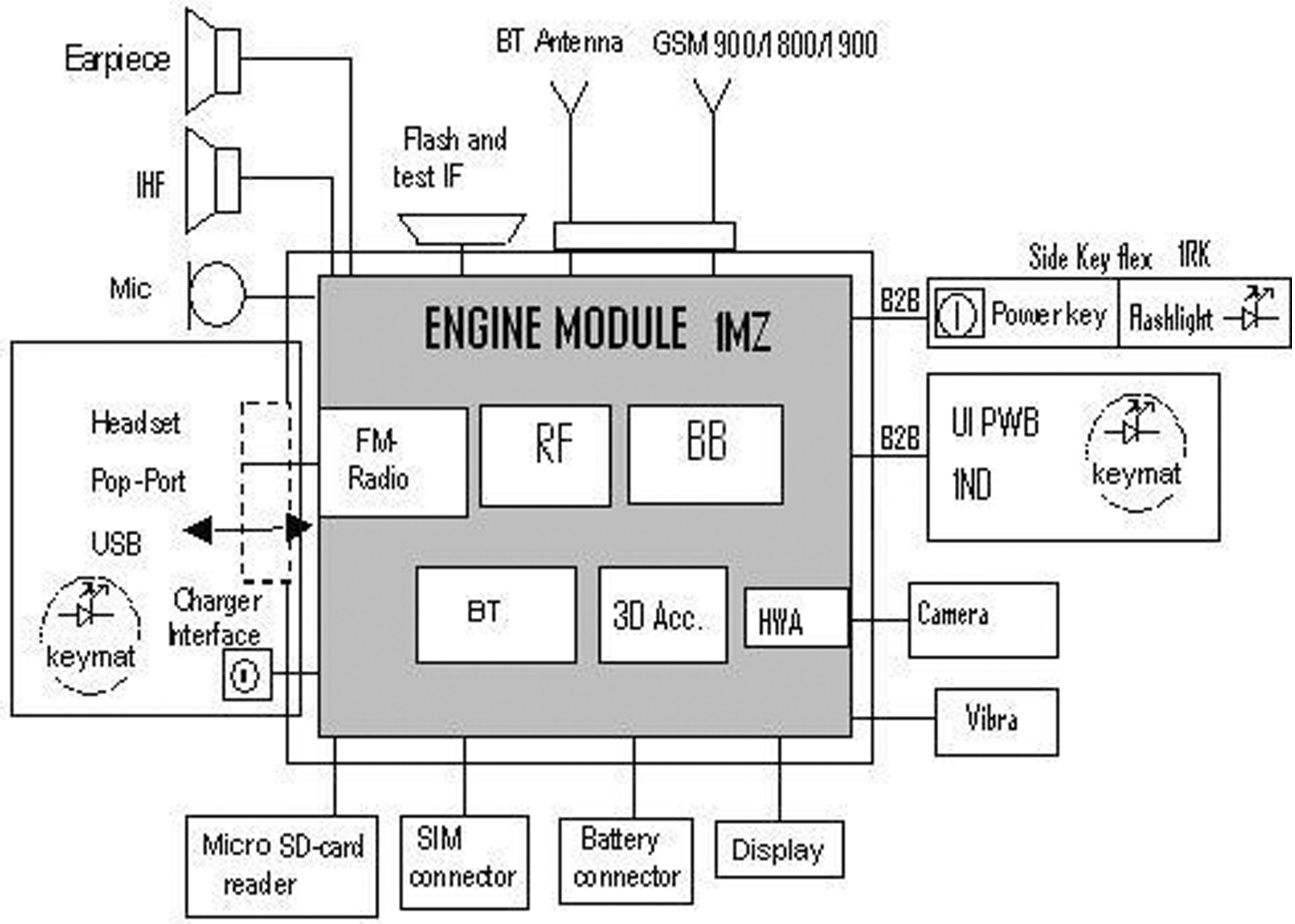

Earpiece
IHF
Mic
BT Antenna
GSM 900/1800/1900
Flash and test IF
Side Key flex 1RK
B2B
Power key
Flashlight
ENGINE MODULE 1MZ
FM-Radio
RF
BB
B2B
UI PWB
1ND
keymat
Headset
Pop-Port
USB
keymat
Charger Interface
BT
3D Acc.
HWA
Camera
Vibra
Micro SD-card reader
SIM connector
Battery connector
Display

Figure 68 System level block diagram

Baseband functional description

Digital baseband consists of ISA based modem and application sections. Modem functionality is in RAPGSM ASIC.

The modem section consists of RAPGSM ASIC and NOR Flash and SDRAM memory as the core. NOR Flash and SDRAM memories are in one package (Combo) RAPGSM supports cellular protocols of GSM (minimum EDGE glass 10, GPRS phase2). Modem SDRAM memory has 256Mbits of memory and NOR flash has 512Mbits of memory. RAPGSM operates with the system clock of 38.4 MHz, which comes from the VCTCXO.

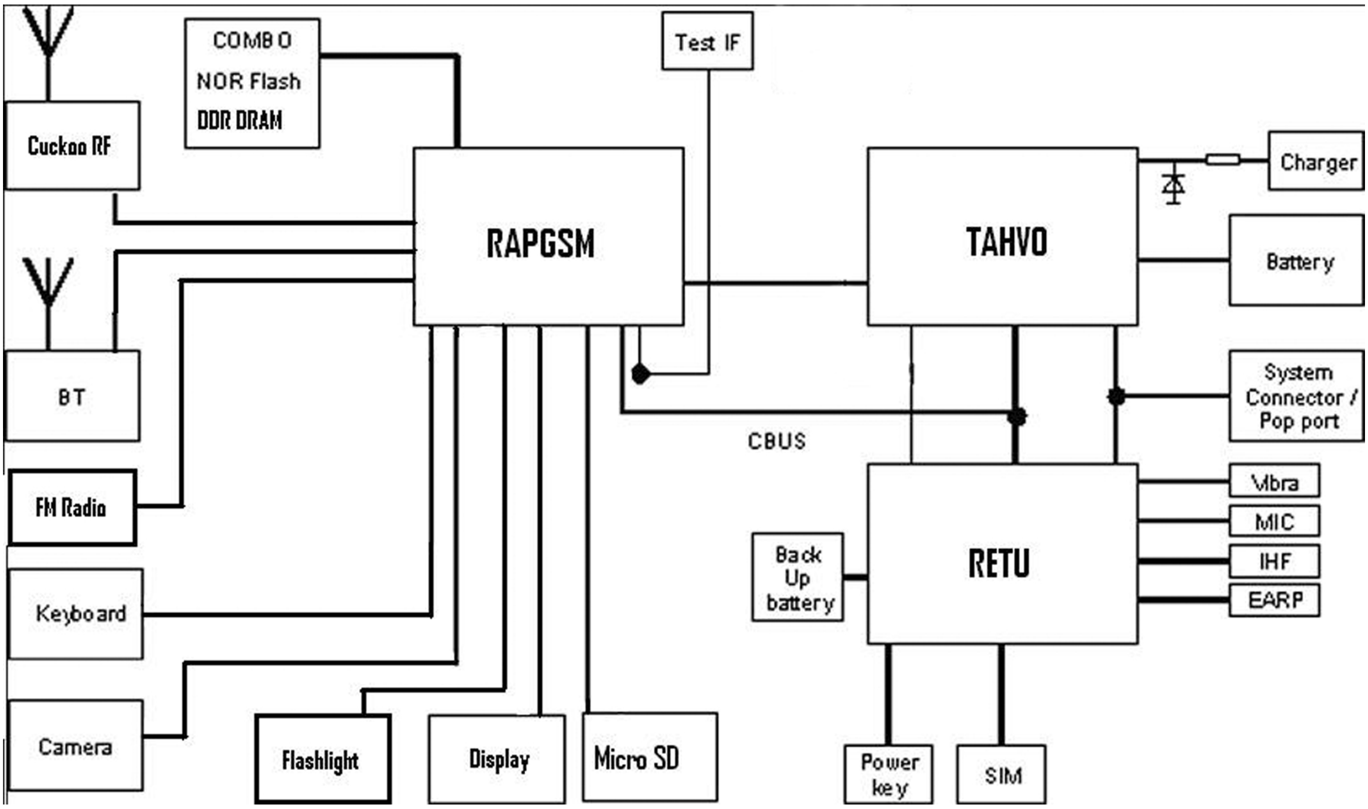

COMBO
NOR Flash
DDR DRAM
Test IF
Cuckoo RF
RAPGSM
TAHVO
Charger
Battery
BT
System Connector / Pop port
CBUS
FM Radio
Vibra
MIC
IHF
EARP
Back Up battery
RETU
Keyboard
Camera
Flashlight
Display
Micro SD
Power key
SIM

Figure 69 RM-86 functional block diagram

Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+4.5	V	Battery voltage maximum value is specified during charging is active
Battery voltage (Call)			+4.3	V	Battery voltage maximum value is specified during charging is active
Charger input voltage	-0.3		+16V	V	
Back-Up supply voltage	0	2.5	2.7	V	Maximum capacity of the backup power supply assumed to be 4 µAh.

Phone modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below RETU master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32kHz oscillator is running (RTC is on).

Mode	Description
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over RETU master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. In this mode certain regulators are enabled and after they and RFClk have stabilized, the system reset (PurX) is released and PWR_ON mode entered. RESET mode uses 32kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low.
FLASHING	FLASHING mode is for SW downloading.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (RETU)	2.2V (typ.)
VMSTR+	Threshold for charging, rising (TAHVO)	2.1V (typ.)
VMSTR-	Threshold for charging, falling (TAHVO)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)
SWCOFF	SW cutoff limit	~3.2V

Power key

The system boots up when power key is pressed (adequate battery voltage, VBAT, present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW).

Power distribution

Power supply components:

- RETU
- TAHVO
- BT LDO
- camera LDO and SMPS
- MicroSD LDO
- backlight SMPS

All the above are powered by the main battery voltage.

Battery voltage is also used on the RF side for power amplifiers (GSM PA) and for RF ASIC Ahne.

Discrete power supplies are used to generate 1.8V and 2.8V for the camera module, 2.85V for MicroSD card and max. 18V for backlight LEDs.

The device supports both 1.8V/3V SIM cards which are powered by RETU / VSIM1. RETUs VSIM2 is not used. USB accessories which needs power from the device are powered by TAHVO / VOUT.

Clocking scheme

In BB5.0, two main clocks are provided to the system: 38.4MHz RF clock produced by VCTCXO in RF section and 32.768kHz sleep clock produced by RETU with an external crystal.

SMPS Clk is 2.4MHz clock line from RAPGSM to Tahvo used for switch mode regulator synchronizing in active mode. In deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

BT Clk is 38.4MHz signal from Ahne ASIC to BT module.

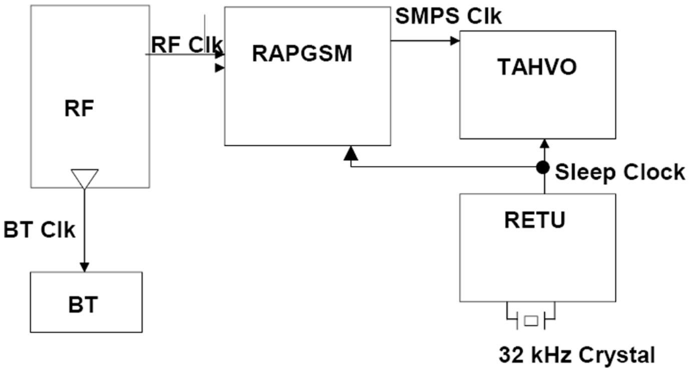


Figure 70 Clocking scheme

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit and one or more slave units. The system provides a radio link that offers a high degree of flexibility to support various applications and product scenarios. Data and control interface for a low power RF module is provided. Data rate is regulated between the master and the slave.

The device Bluetooth is based on BC4 ROM1.0RDL BT chip.

USB

USB (Universal Serial Bus) provides a wired connectivity between host PC and peripheral devices.

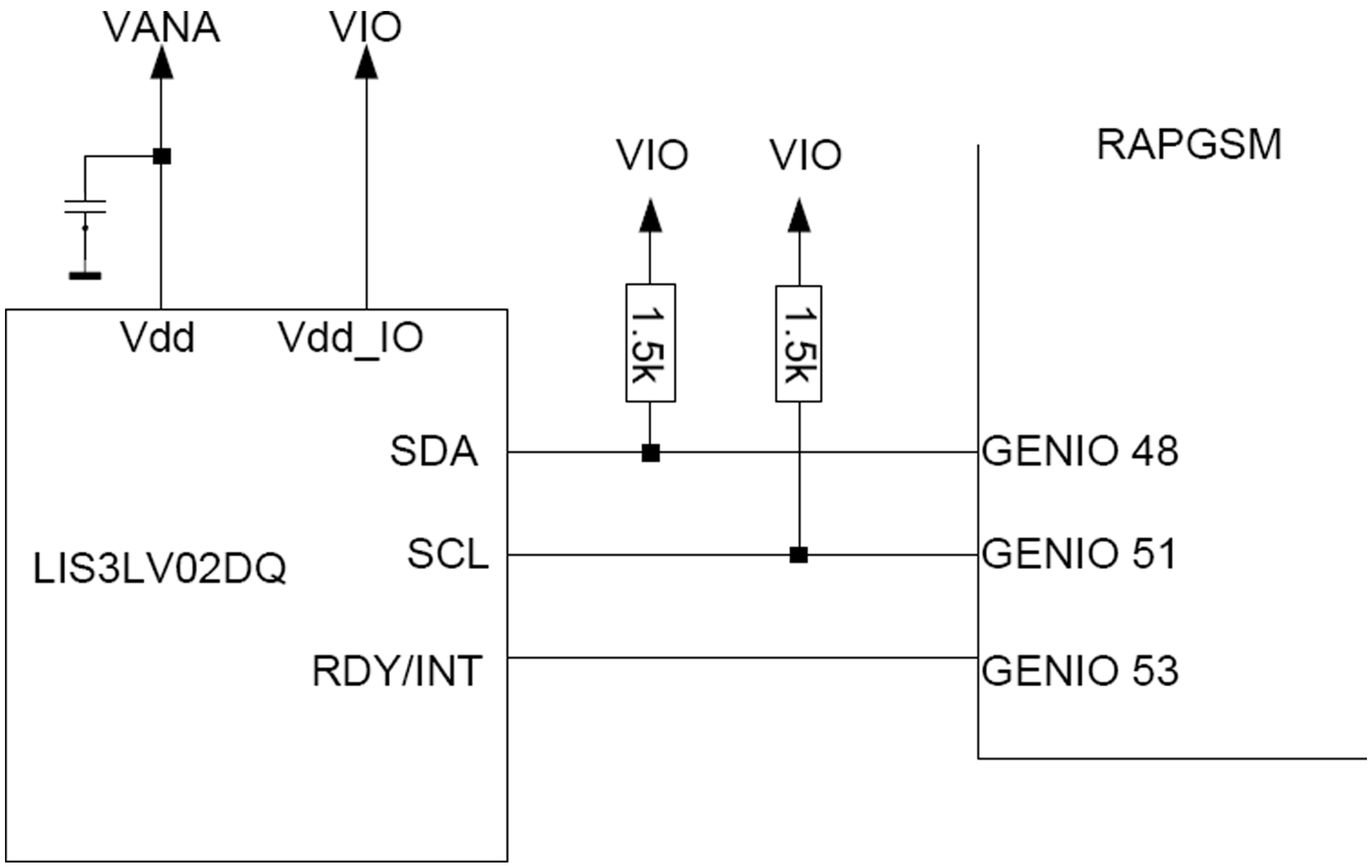
USB is a differential serial bus for USB devices. USB controller (RAPGSM) supports USB specification revision 2.0 with full speed USB (12 Mbps). The device is connected to the USB host through the Pop-Port™ connector. The USB bus is hot plugged capable, which means that USB devices may be plugged in/out at any time.

Accelerometer

Accelerometer can detect acceleration that is caused by speed change. It also detects acceleration that is caused by Earth.

Accelerometer is used for implementing pedometer and tapping commands.

Accelerometer is controlled via an I2C bus. Acceleration data is transferred via the I2C bus.



FM radio

The FM radio circuitry is implemented using a highly integrated radio TEA5761UK. The MCU SW controls the FM radio circuitry through I2C interface.

The analogue single ended stereo output, VAFL and VAFL, are fed to the Retu’s MIC3 microphone input through 100nF capacitors.

The antenna of the FM Radio is created with the headset. The wires of the headset are used as poles of the antenna.

Camera

The device uses 2MP SMIA camera module. 2MP SMIA is 2Mpixel camera with sensor resolution of 1600 x 1200.

Backup battery

When the main battery is not attached EM ASIC (N2200) goes in backup mode using back-up battery that supplies voltage to RTC in EM ASIC (N2200).

CBUS interface

CBUS is a "main" system control bus in BB5.0. RAP controls the functionality of EM ASIC (N2200) and EM ASIC (N2300) ASICs with CBUS.

CBUS is a four-wire half-duplex master-slave interface. In BB5.0 CBUS clock frequency is 2.4 MHz.

FBUS

USB and FBUS have multiplexed interface between EM ASIC (2300) and RAP.

ACI interface

The ACI (Accessory Control Interface) is a point-to-point, bi-directional, single line serial bus.

It has two main features: the insertion and removal detection of an accessory device and acting as a data bus between phone and accessory, intended for control purposes. A third function of ACI is to identify and authenticate the accessory.

VOUT interface

Accessory power is supplied by VOUT, a linear low drop-out regulator in EM ASIC (N2300) providing 2.5V at 90mA maximum when active (0.5mA in sleep).

ACI data passes to and from EM ASIC (N2300) via the HeadDet line. EM ASIC (N2300) connects HeadDet to MBUS for RAP to access.

Charger interface

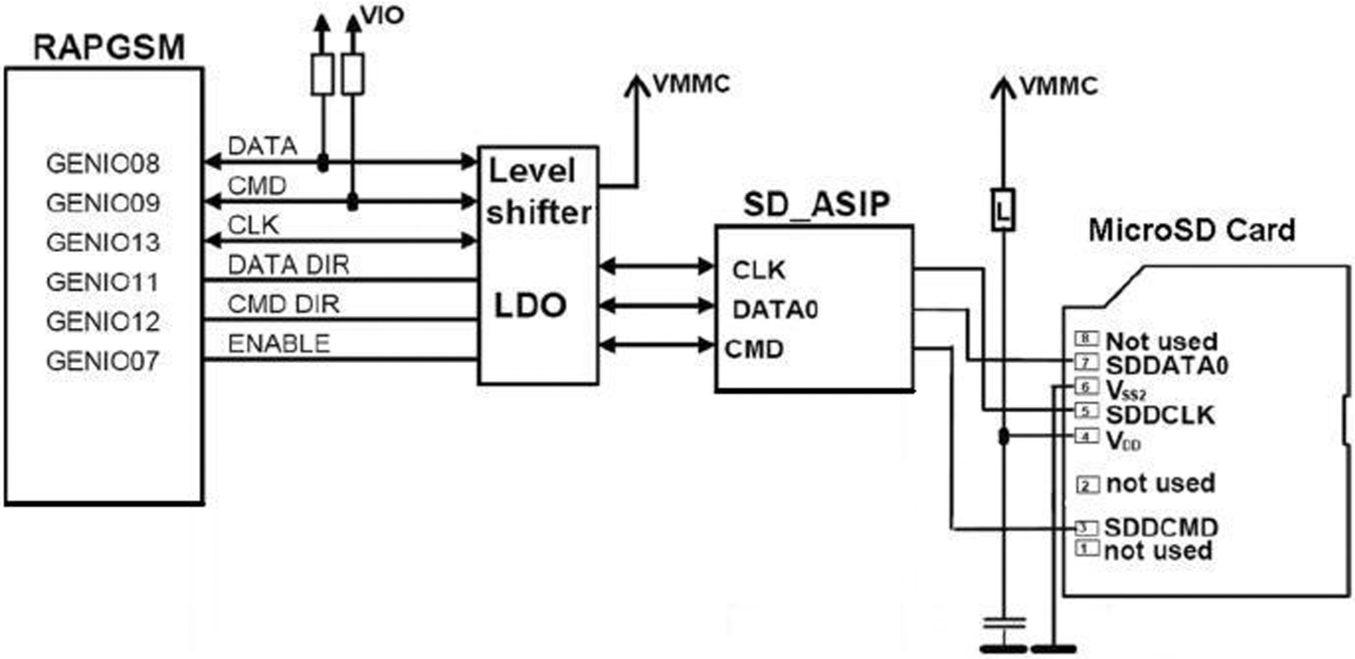
Charging control and charge switch are in TAHVO.

If the temperature rises too high and the thermal protection is activated, TAHVO goes to protection mode.

MicroSD interface

MicroSD interface

The MicroSD card interface is electrically and functionally compatible with SD card interface.


RAPGSM
GENIO08
GENIO09
GENIO13
GENIO11
GENIO12
GENIO07
VIO
DATA
CMD
CLK
DATA DIR
CMD DIR
ENABLE
Level shifter
LDO
VMMC
SD_ASIP
CLK
DATA0
CMD
VMMC
L
MicroSD Card
8 Not used
7 SDDATA0
6 VSS2
5 SDDCLK
4 VDD
2 not used
3 SDDCMD
1 not used

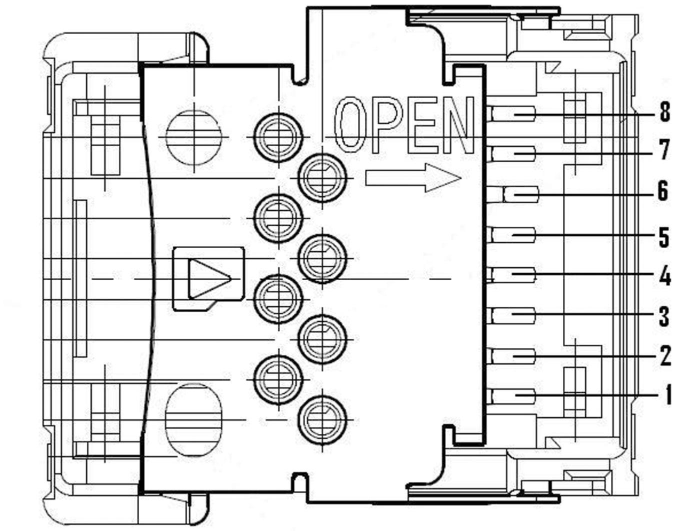


Figure 71 MicroSD reader pins

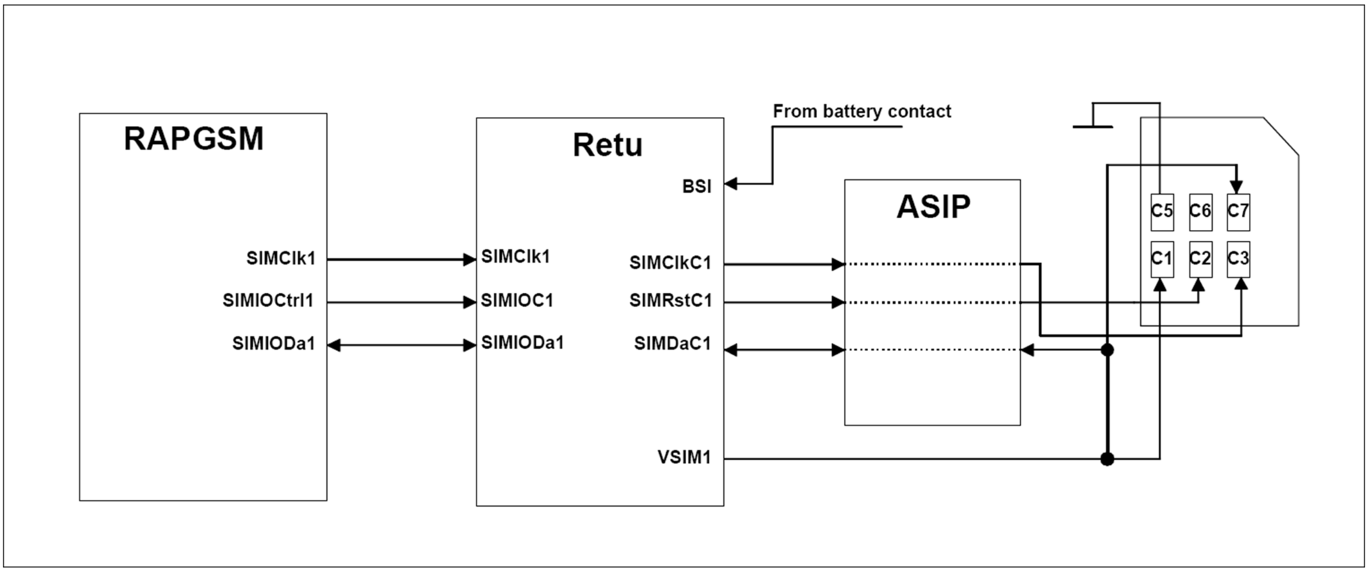
Table 12 MicroSD Interface

Pin	Signal	I/O	Engine connection		Notes
1	RSV		NC	NC	Reserved for future use
2	RSV		NC	NC	Reserved for future use
3	CMD	<->	RAPGSM	Genio09	Command/Response
4	VDD	<-	Ext.regulator	VMMC	VMMC, supply voltage 2.85V (Max 150mA)
5	CLK	<-	RAPGSM	Genio13	External clock for the MMC card, Max 25 MHz
6	Vss2		GND		Ground
7	DAT	<->	RAPGSM	GENIO08	Bi-directional data bus
8	RSV		NC	NC	Reserved for future use

SIM/USIM

The device has one SIM (Subscriber Identification Module) interface and the SIM card locates under the battery.

SIM interface consists of internal interface between RAPGSM and Retu and an external interface between Retu and SIM contacts.


RAPGSM
SIMClk1
SIMIOCtrl1
SIMIODa1
Retu
BSI
SIMClk1
SIMIOC1
SIMIODa1
SIMClkC1
SIMRstC1
SIMDaC1
VSIM1
From battery contact
ASIP
C5
C6
C7
C1
C2
C3

Retu handles SIM card detection and the detection method is based on battery removal trough the BSI line.

Due to location of the SIM card, removal of the battery causes quick power down of the SIM IF. The Retu SIM1 interface supports both the 1.8V and 3.0V SIM cards.

Battery interface

The battery interface supports a 3-pole battery interface. The interface consists of three connectors: VBAT, BSI and GND.

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

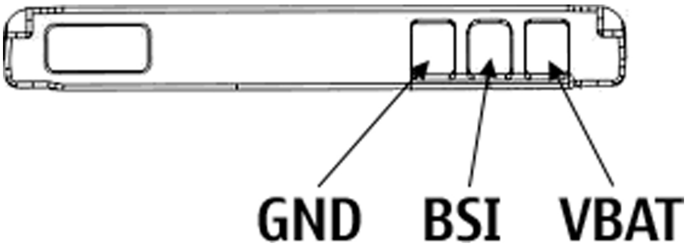

GND
BSI
VBAT

Figure 72 Battery pin order

Battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line.

For service purposes, the device SW can be forced into local mode by using pull down resistors connected to the BSI line.

User interface

Display interface

Display module mechanical concept

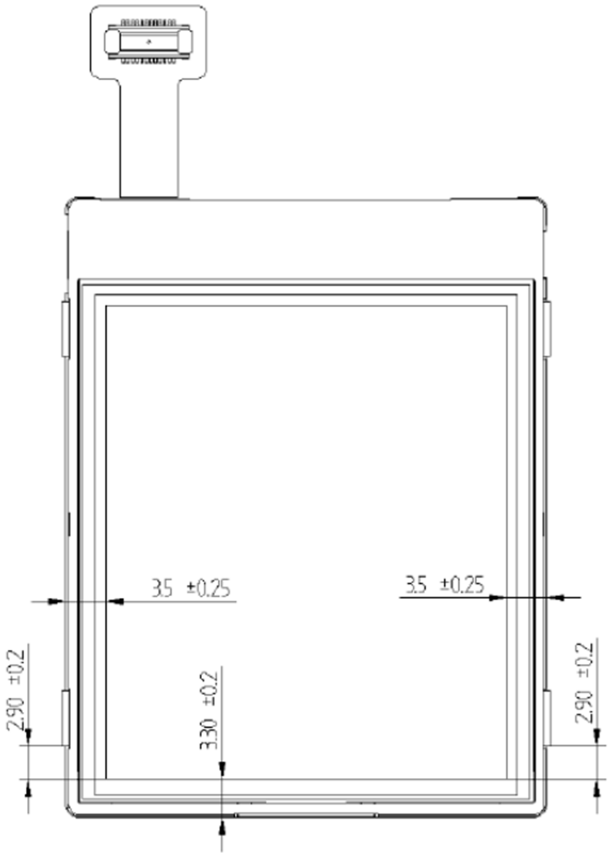


Figure 73 LCD module

Display features:

- 208x208 resolution with 262k colors
- Active area is 1.67"
- Partial display function Power saving by pausing display process on part of the screen.
- Built-in RAM capacity 208rows×208lines×18bit

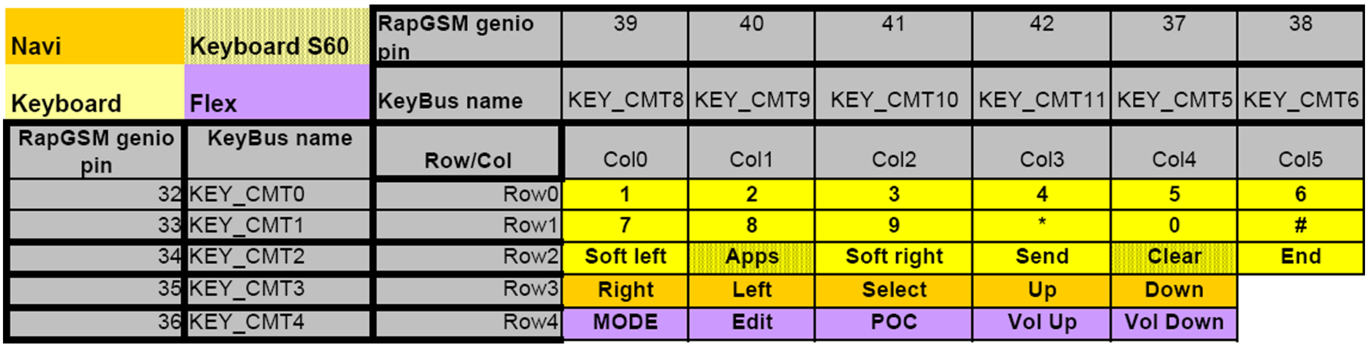
Display is controlled via MeSSi interface by RAPGSM. All MeSSi signals are going through the EMC filtering ASIPs.

Keyboard

The device keyboard consists of 29 separate keys.

The keyboard is partitioned in two separate keyboards: upper (23 numeric and function keys) and side keys (6 keys; PRW key and 5 side keys).

The keyboard is implemented as a matrix keyboard, which is connected directly to the dedicated keyboard GENIO lines.



Navi	Keyboard S60	RapGSM genio pin	39	40	41	42	37	38
Keyboard	Flex	KeyBus name	KEY_CMT8	KEY_CMT9	KEY_CMT10	KEY_CMT11	KEY_CMT5	KEY_CMT6
RapGSM genio pin	KeyBus name	Row/Col	Col0	Col1	Col2	Col3	Col4	Col5
32	KEY_CMT0	Row0	1	2	3	4	5	6
33	KEY_CMT1	Row1	7	8	9	*	0	#
34	KEY_CMT2	Row2	Soft left	Apps	Soft right	Send	Clear	End
35	KEY_CMT3	Row3	Right	Left	Select	Up	Down	
36	KEY_CMT4	Row4	MODE	Edit	POC	Vol Up	Vol Down	

Figure 74 RM-86 keyboard matrix

Backlights

Backlights

There are four white LEDs for numeric keyboard backlight and a red, white and yellow-green LED for mode key backlight.

The display includes four white LEDs for display backlights inside of the display module. Voltage source for backlights is implemented using an external white LED driver.

ASICs

RAPGSM ASIC

RAPGSM is a GSM EDGE chip.

Retu EM ASIC N2200

EM ASIC N2200 includes various control functions.

Tahvo EM ASIC (N2300)

Tahvo EM ASIC (N2300) is intended for energy management control, supply voltage generation and charge control of mobile phone.

Device memories

RAPGSM memories NOR flash and SDRAM

Modem memory consists of 256Mbit SDRAM and 512Mbit NOR flash memory.

Audio concept

Audio HW architecture

The functional core of the audio hardware is built around two ASICs: RAPGSM engine ASIC and the mixed-signal ASIC Retu.

Retu provides an interface for the transducers and the accessory connector. Integrated hands free stereo spekers are driven by a D-class audio amplifier TPA2012D2.

There are four audio transducers:

- 8 mm dynamic earpiece
- 20 mm dynamic speaker
- electret 4x1.5 mm microphone

In addition to the audio transducers, Retu also provides an output for the dynamic vibra component.

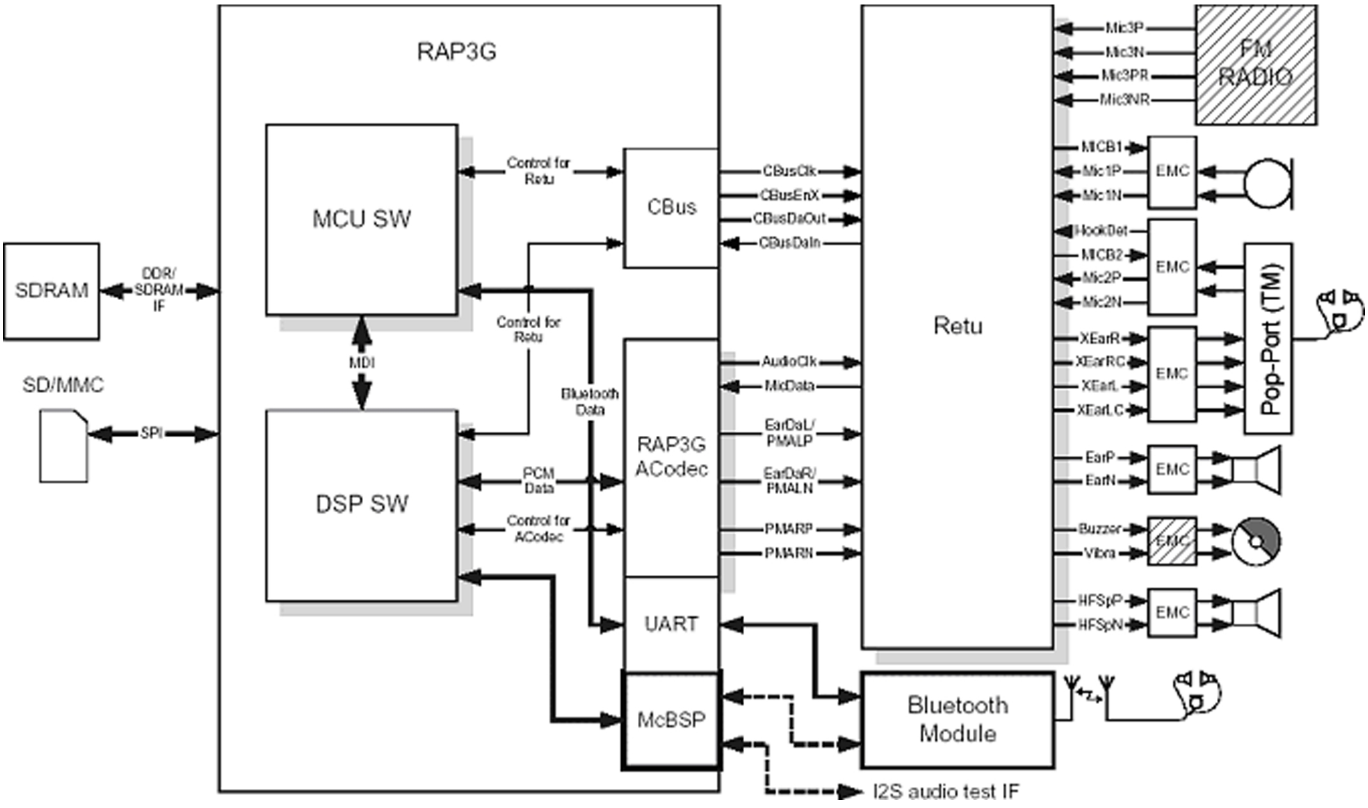

RAP3G
MCU SW
DSP SW
CBus
RAP3G ACodec
UART
McBSP
SDRAM
DDR/ SDRAM IF
SD/MMC
SPI
MDI
Control for Retu
Control for Retu
Bluetooth Data
PCM Data
Control for ACodec
CBusClk
CBusEnX
CBusDaOut
CBusDaIn
AudioClk
MicData
EarDaL/ PMALP
EarDaR/ PMALN
PMARP
PMARN
Retu
Bluetooth Module
I2S audio test IF
Mic3P
Mic3N
Mic3PR
Mic3NR
FM RADIO
MICB1
Mic1P
Mic1N
HookDet
MICB2
Mic2P
Mic2N
XEarR
XEarRC
XEarL
XEarLC
EarP
EarN
Buzzer
Vibra
HFSpP
HFSpN
EMC
Pop-Port (TM)

Figure 75 Audio block diagram

Internal microphone

Internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes.

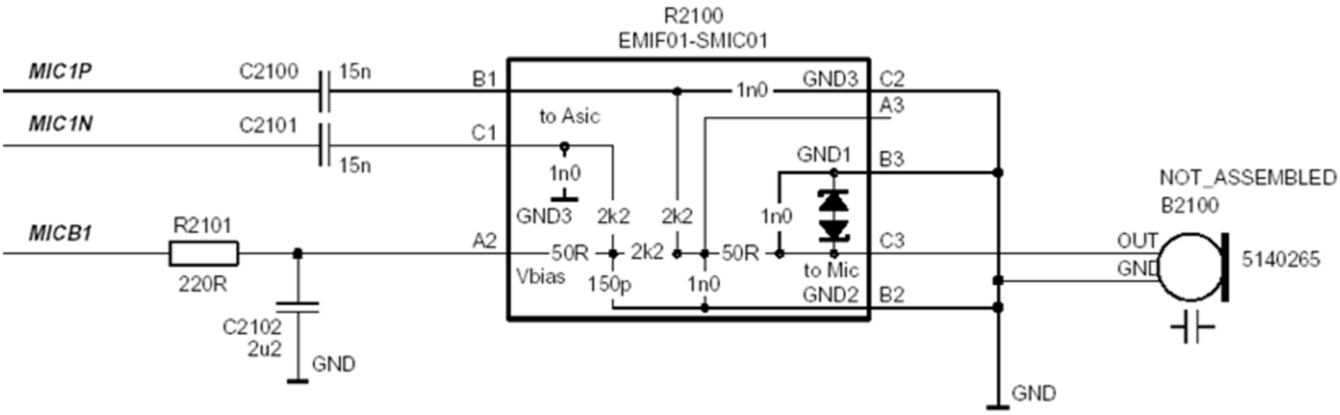

R2100
EMIF01-SMIC01
MIC1P
MIC1N
MICB1
C2100
15n
C2101
15n
R2101
220R
C2102
2u2
GND
B1
C1
A2
to Asic
1n0
GND3
2k2
2k2
50R
2k2
50R
Vbias
150p
1n0
1n0
GND3
GND1
1n0
to Mic
GND2
C2
A3
B3
C3
B2
GND
NOT_ASSEMBLED
B2100
OUT
GND
5140265

Figure 76 Internal microphone circuitry

External microphone

Galvanic accessories are connected to the system connector.

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

Internal earpiece

Internal earpiece is used for the HandPortable (HP) call mode. A dynamic 8mm earpiece capsule is employed.

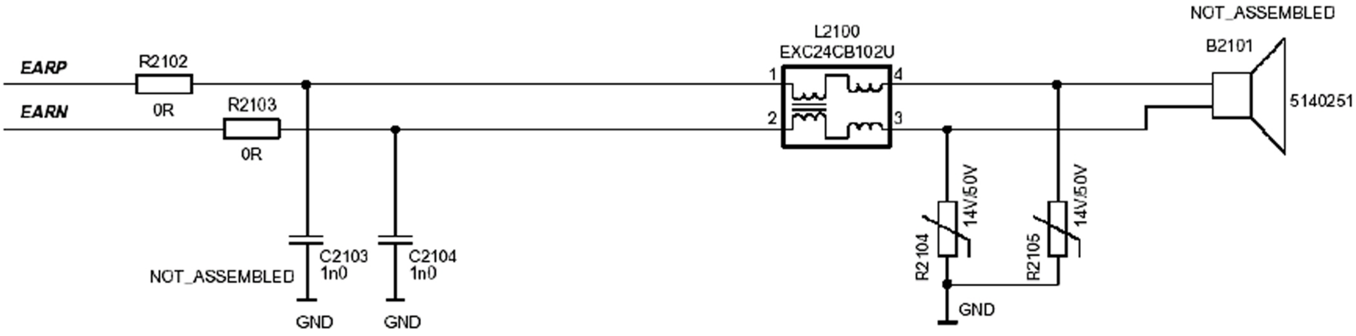

EARP
EARN
R2102
0R
R2103
0R
NOT_ASSEMBLED
C2103
1n0
C2104
1n0
GND
GND
L2100
EXC24CB102U
1
2
3
4
R2104
14V/50V
R2105
14V/50V
GND
NOT_ASSEMBLED
B2101
5140251

Figure 77 Internal earpiece circuitry

Internal speakers

Internal speakers are used for Internal HandsFree (IHF) call mode, ringing tones, FM-radio and music listening.

Dynamic 11x15 mm speaker is employed.

External earpiece

All galvanic accessories are connected to the system connector (Pop-Port™).

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

Xear lines have 22 Ω series resistors in each line.

Analogue switches (type TS5A3159) are in the Xear lines to attenuate the headset signal level in IHF mode, when headset is inserted. The attenuation is about 15 dB.

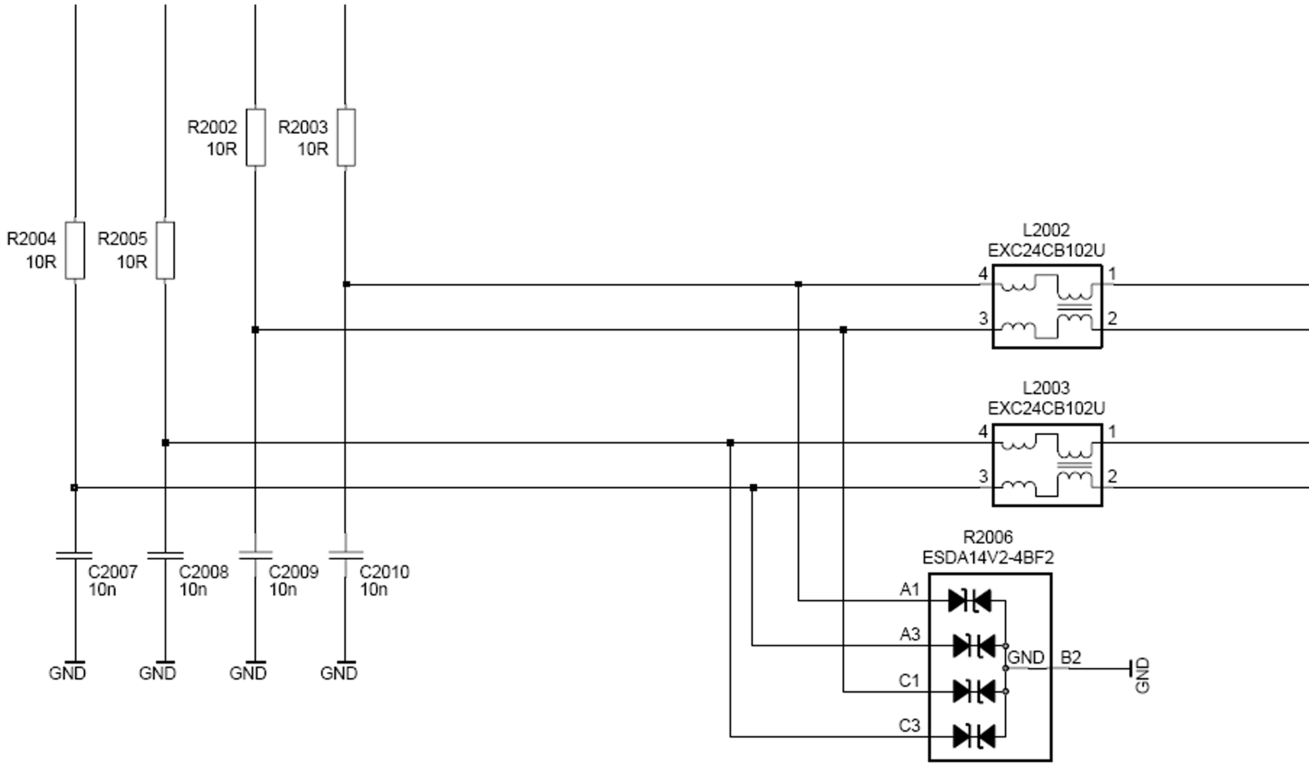

R2002
10R
R2003
10R
R2004
10R
R2005
10R
L2002
EXC24CB102U
4
1
3
2
L2003
EXC24CB102U
4
1
3
2
C2007
10n
C2008
10n
C2009
10n
C2010
10n
GND
GND
GND
GND
R2006
ESDA14V2-4BF2
A1
A3
C1
C3
GND
B2
GND

Figure 78 External earpiece circuitry (Pop-Port connected on the right)

Vibra circuitry

Vibra is used for vibra-alarm function.

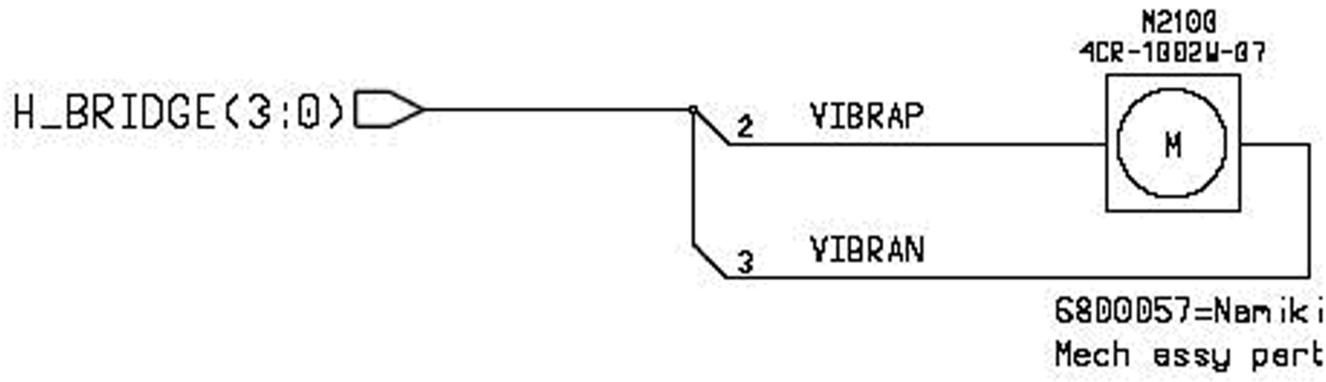

N2100
4CR-1002W-07
H_BRIDGE(3:0)
2
VIBRAP
M
3
VIBRAN
6800057=Namiki
Mech assy part

Figure 79 Vibra circuitry

Baseband technical specifications

External interfaces

Name of Connection	Connector reference
USB	X2000
Charger	X2000
Headset	X2000
SIM	X2700
MicroSD	X3200
Battery connector	X2070

Pop-Port^{TM} connector

Pop-Port^{TM} connector provides a fully differential 4–wire stereo line-level output connection and fully differential 2-wire mono line-level or microphone level input connection.

The earpiece and headset signals are multiplexed so that the outputs cannot be used simultaneously.

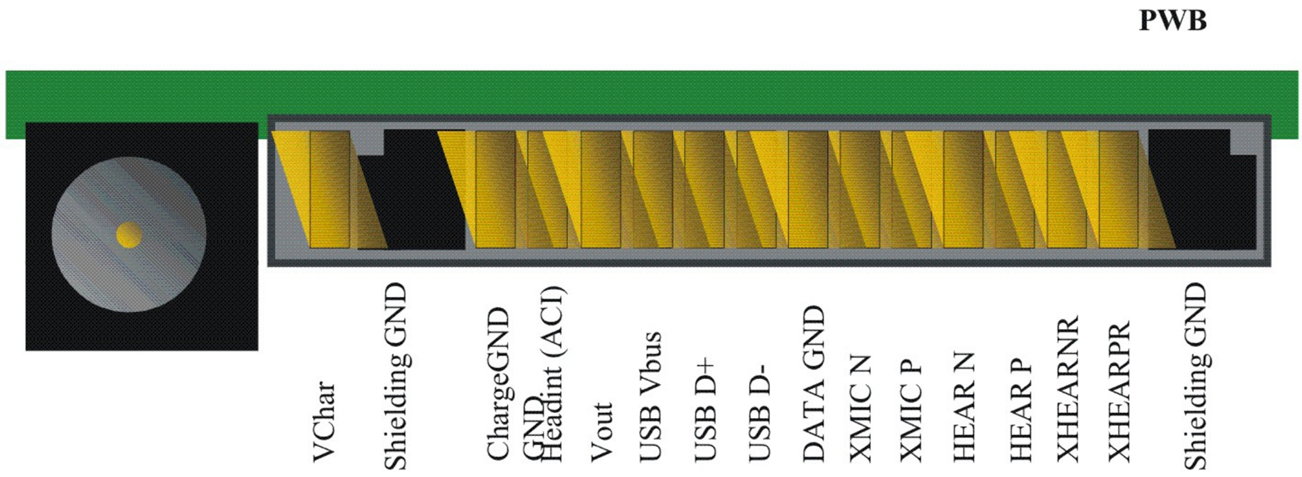

PWB
VChar
Shielding GND
ChargeGND
GND
Headint (ACI)
Vout
USB Vbus
USB D+
USB D-
DATA GND
XMIC N
XMIC P
HEAR N
HEAR P
XHEARNR
XHEARPR
Shielding GND

Figure 80 External audio connector

Table 13 Audio connector pin assignments

Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
1/ Charge	V Charge	DC	0-9V/ 0.85A		
2/ GND	Charge GND	-	0.85A	100mΩ (PWB+ conn.)	
3/ ACI	ACI	1kbits/s	Digital 0 / 2.5-2.78V	47Ω	Insertion & removal detection
4/ Vout	DC out	DC	2.78V 70 mA 2.5V 90mA	100mΩ (PWB+ conn.)	200mW
9 / XMIC N	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
10 / XMIC P	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
11 / HEAR N	Audio out	20-20k	1Vpp	22Ω	
12 / HEAR P	Audio out	20-20k	1Vpp	22Ω	
13 / HEAR R N	Audio out	20-20k	1Vpp	22Ω	Not conn. in mono
14 / HEAR R P	Audio out	20-20k	1Vpp	22Ω	Not conn. in mono

SIM connections

Table 14 SIM IF connections

Pin	Signal	I/O	Engine connection		Notes
C1	VSIM	Out	Retu	VSIM1	Supply voltage to SIM card, 1.8V or 3.0V.
C2	SIMRST	Out	Retu	SIM1Rst	Reset signal to SIM card
C3	SIMCLK	Out	Retu	SIM1ClkC	Clock signal to SIM card
C5	GND	-	GND		Ground
C7	SIMDATA	In/Out	Retu	SIM1DaC	Data input /output

Charger connector and charging interface connections & electrical characteristics

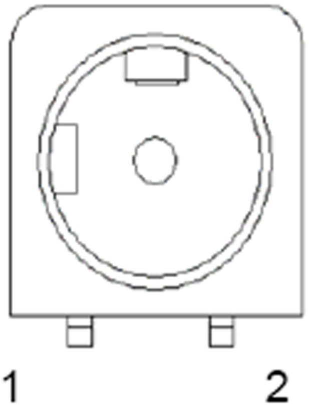


Figure 81 Charger connector

Table 15 Charging interface connections

Pin	Signal	I/O	Engine connection		Notes
1	Vchar	In	N2300	VCharIn1, 2	Charging voltage / charger detection, Center pin
2	Charge GND		Ground		Charger ground

Table 16 Charging IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vchar	V Charge	0	9	V	Center pin
Vchar	I Charge		0.85	A	Center pin
Charge GND			0.85	A	

Battery connector and interface connections & electrical characteristics

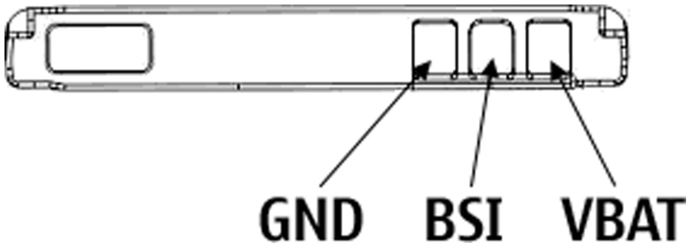


Figure 82 Battery connector

Table 17 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage

Pin	Signal	I/O	Engine connection		Notes
2	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

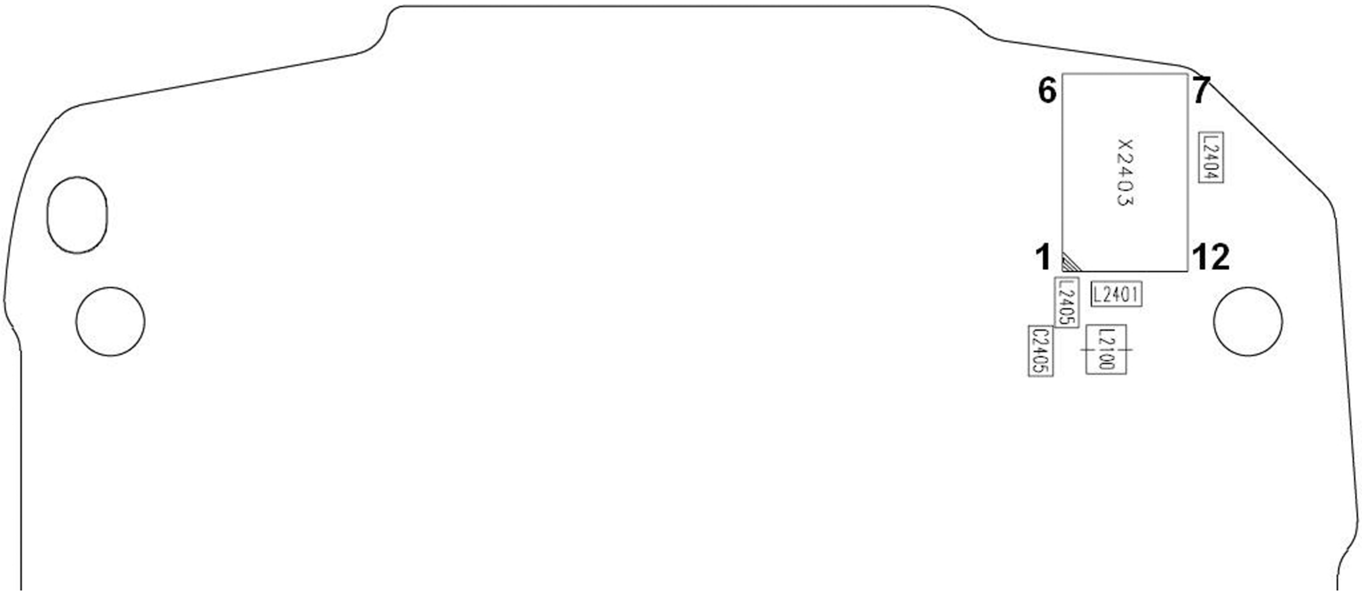
Table 18 Battery IF electrical characteristics

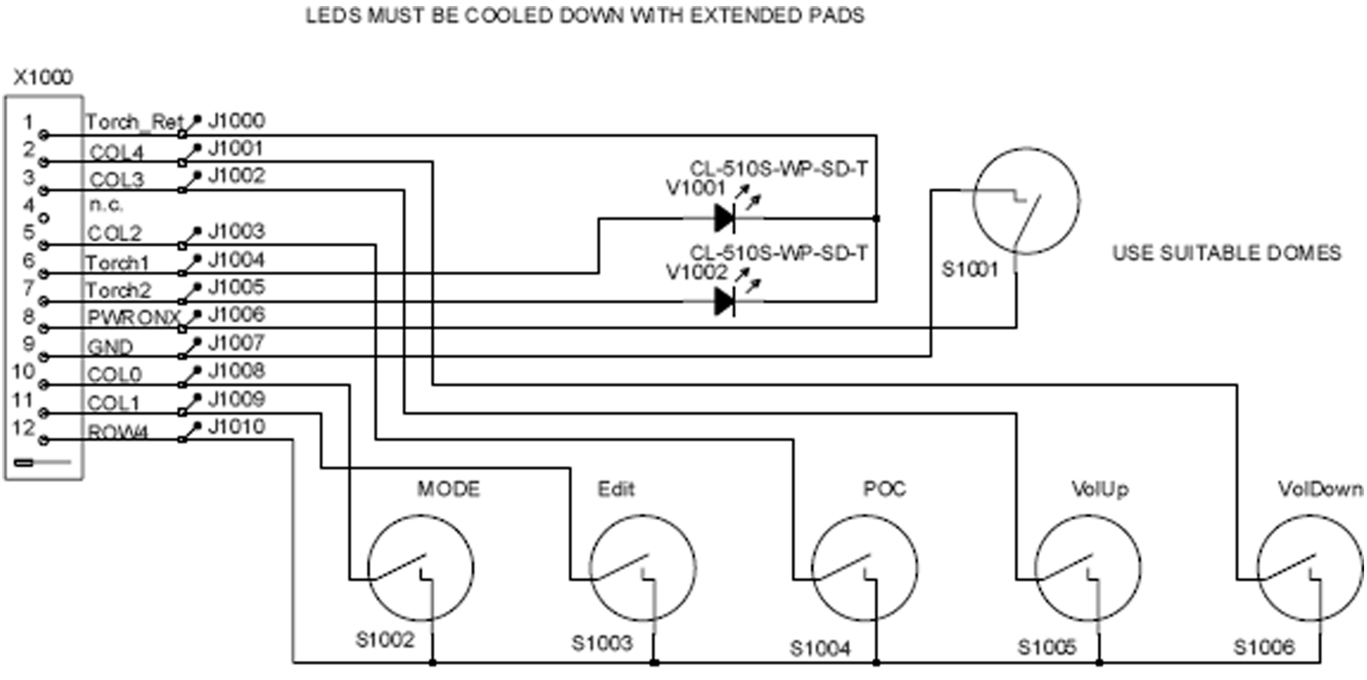
Description	Parameter	Max	Unit
Operation voltage	V_{IN}	4.23	VDC
Current rating	I_{IN}	0.9	A

Internal interfaces

Name of Connection	Connector reference	Notes
Side key Flex connector	X2403	
Display	X2401	
Camera	X1470	SMIA 2MP
Vibra	M2100	
Microphone	B2100	
Earpiece	B2101	
IHF speaker	B2102	
UI PWB connector	X2400	

IF connections




LEDS MUST BE COOLED DOWN WITH EXTENDED PADS
X1000
1
2
3
4
5
6
7
8
9
10
11
12
Torch_Ret
COL4
COL3
n.c.
COL2
Torch1
Torch2
PWRONX
GND
COL0
COL1
ROW4
J1000
J1001
J1002
J1003
J1004
J1005
J1006
J1007
J1008
J1009
J1010
CL-510S-WP-SD-T
V1001
CL-510S-WP-SD-T
V1002
S1001
USE SUITABLE DOMES
MODE
Edit
POC
VolUp
VolDown
S1002
S1003
S1004
S1005
S1006

Flex connector

Pin & pad	Signal
1	Column3
2	Column2
3	Column1
4	Column0
5	Column5
6	Row4
7	Row3
8	Row2
9	Row1
10	Row0
11	VLEDINKB
12	VLEDOUTKB
13	MODE_LED_Supply
14	MODE_LED_White
15	MODE_LED_Green
16	MODE_LED_Red

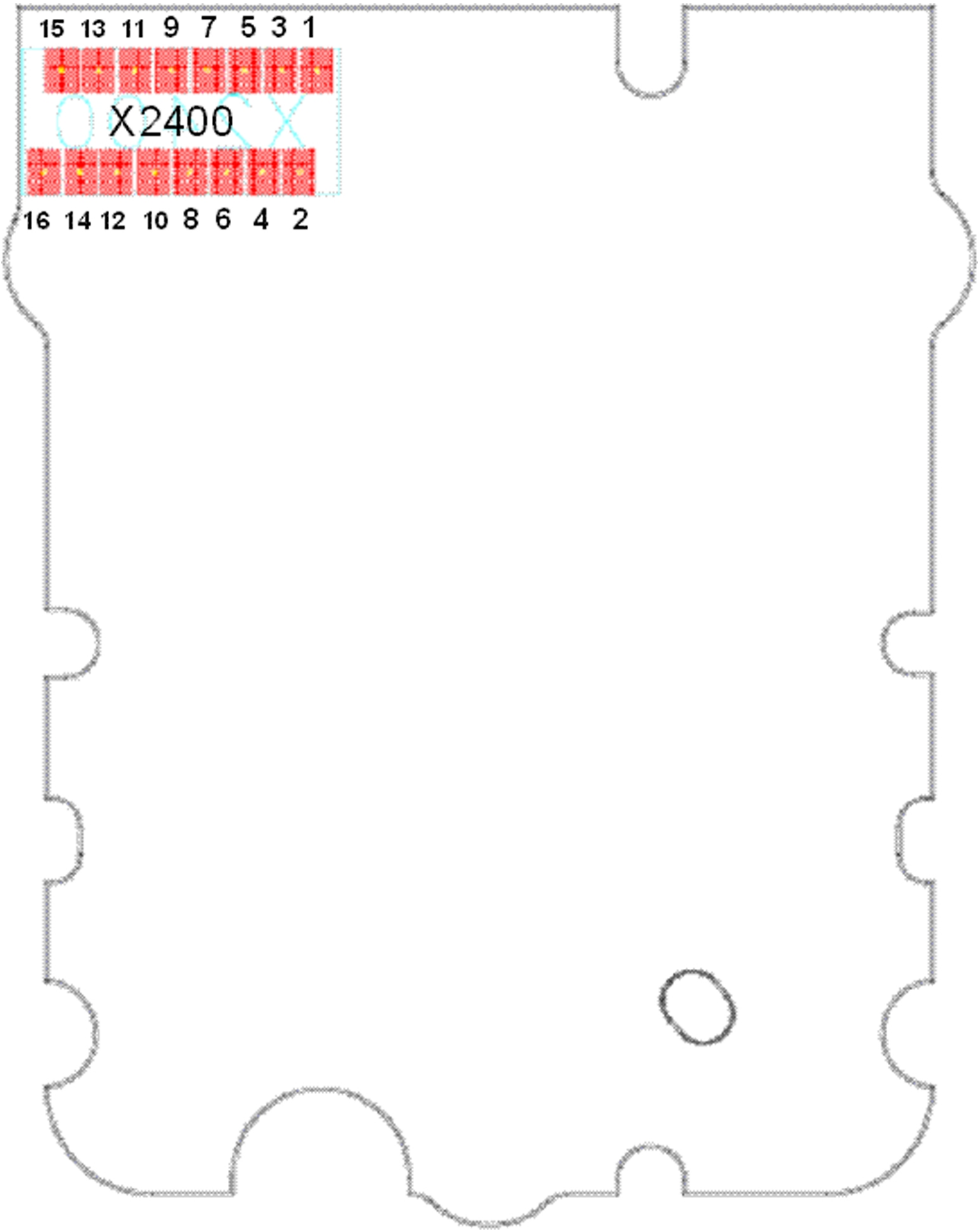


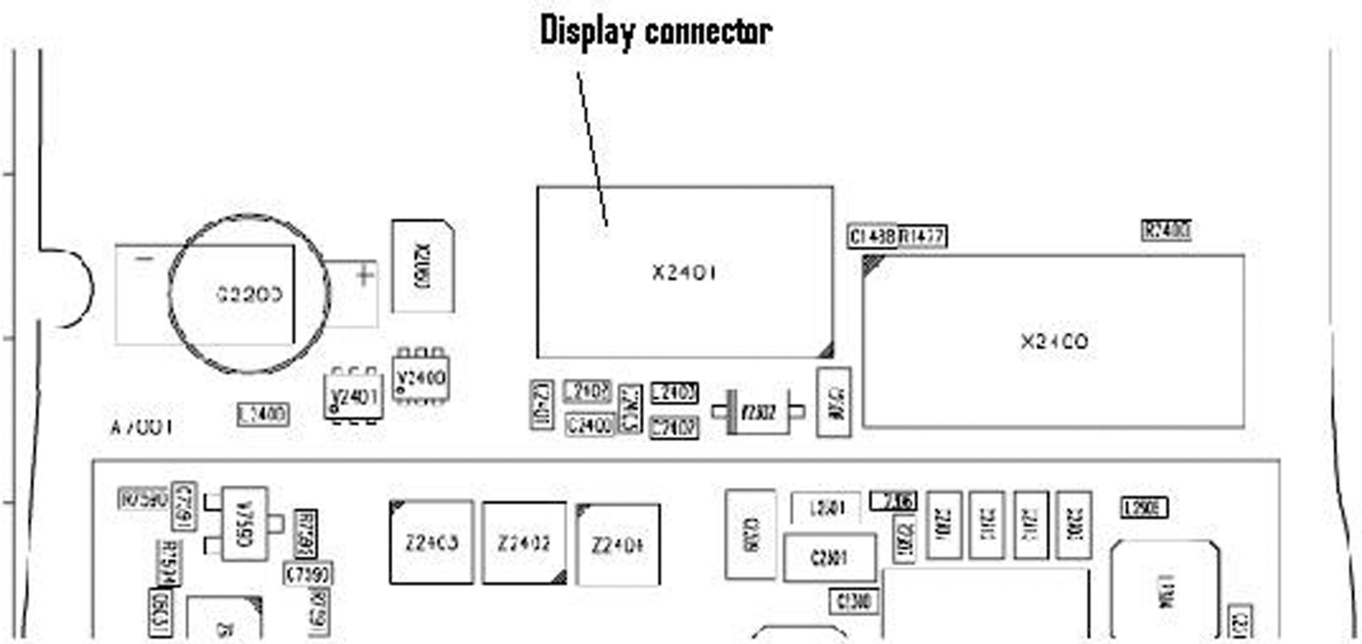
Figure 83 Keyboard PWB

Keyboard interface electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
High-level input voltage (VIO = 1.8V)	VIH	0.65x VIO	VIO	0.3+ VIODDS	V	Row
Low-level input voltage	VIL	-0.3	0	0.35x VIO	V	Row
High-level output voltage	VOH	VIO- 0.45	VIO	VIO + 0.3	V	Column

Description	Parameter	Min	Typ	Max	Unit	Notes
Low-level output voltage	VOL	-0.3	0	0.35xVIO	V	Column

Display connector and interface connections



Back-up battery interface electrical characteristics

Table 19 Back-up battery connections

Pin name	I/O	Connection	Notes
L2207, VBack	->	N2200, VBack	Back-up battery G2200 is connected to N2200 via coil

Table 20 Back-up battery electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
Back-Up Battery Voltage	Vback	0	2.5	2.7	V

RF description

Introduction to receiver functionality

Receiver functions are implemented in an RF ASIC.

The receiver is a linear direct conversion receiver consisting of separate front ends (LNA (Low Noise Amplifier) and demodulator) for each supported system. After the demodulators, the signal paths are combined to one common BB path.

GSM receiver functionality

As GSM Rx branches are functionally identical, the following description is applicable to all of them.

The received signal goes from the GSM antenna to the antenna switch module.

The antenna switch module is followed by integrated LNAs residing in the Rx ASIC.

The LNAs are followed by demodulators which downconvert the signal to baseband I and Q signals.

The channel select filter is set to 115 kHz in the GSM mode.

Introduction to transmitter functionality

Transmitter functions are implemented in an RF ASIC. The ASIC contains a BB frequency low pass filter, which is tunable according to the signal bandwidth of the system in use.

In addition, the ASIC contains separate RF paths comprising a final frequency IQ modulator and VGA amplifiers.

GSM transmitter functionality

An RF ASIC receives an analogue IQ modulated signal from digital BB, which is first low pass filtered with filter corner frequency set to approximately 200 kHz. After the filter, the signal is routed to the GSM modulator. The amplifier gives 40 dB of power control dynamic range.

After the VGA stage the signal exits the RF ASIC. In case of GSM1800/1900 the signal goes directly to the GSM PA module. In case of EGSM900, the PA module is preceded by a SAW filter. After the filter, the signal is fed to the GSM PA module. Finally, the signal is routed via the antenna switch to the antenna.

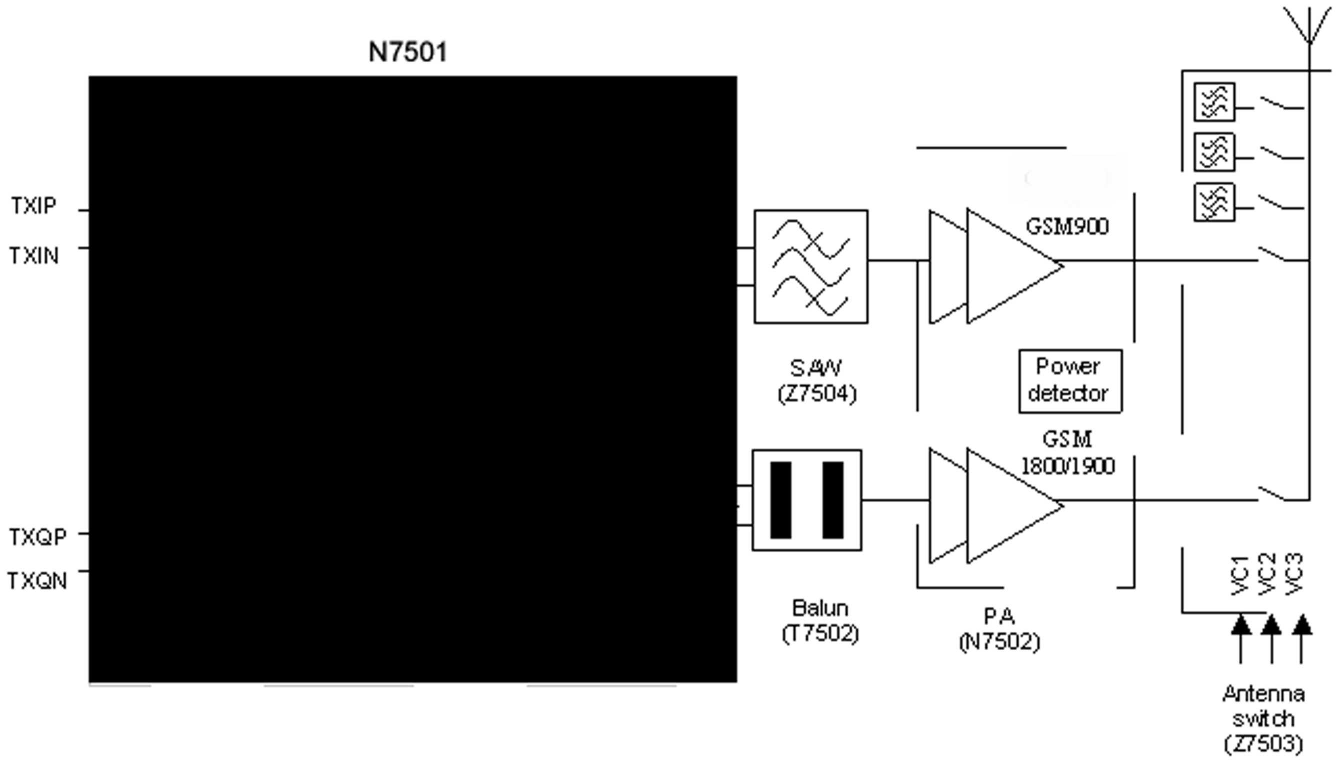


Figure 84 GSM transmitter

GSM power control

A closed control loop comprise an integrated power detector (in PA module) and an error amplifier. The error amplifier resides in N7501, and it controls the transmitter power of GSM.

The power control loop is enabled and disabled by writing an appropriate register in N7501 RF ASIC. In case of dual slot transmission, the output power is ramped down between the consecutive slots.

GSM PA module

A single GSM/EDGE PA module contains two separate amplifier chains, one for EGSM900 and another for GSM1800/1900. Both amplifiers have a battery supply connection and two bias current inputs.

Frequency synthesizers

RF has separate synthesizers for Rx and Tx. Both synthesizers consist of:

- PLL (Phase-Locked Loop)
- loop filter
- VCO (Voltage Controlled Oscillator)
- balun

The VCO frequencies are locked by PLLs into a reference oscillator, VCTCXO (Voltage Controlled Temperature Compensated Crystal Oscillator).

The PLLs are located in RF ASICs and controlled via RFBus.

Reference oscillators

A 38.4MHz VCTCXO is used as a reference oscillator for the frequency synthesizers.

Regulators

RF ASICs contain integrated regulators to supply regulated voltages for their internal circuitry and other RF parts.

Frequency mappings

EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

10 — Schematics

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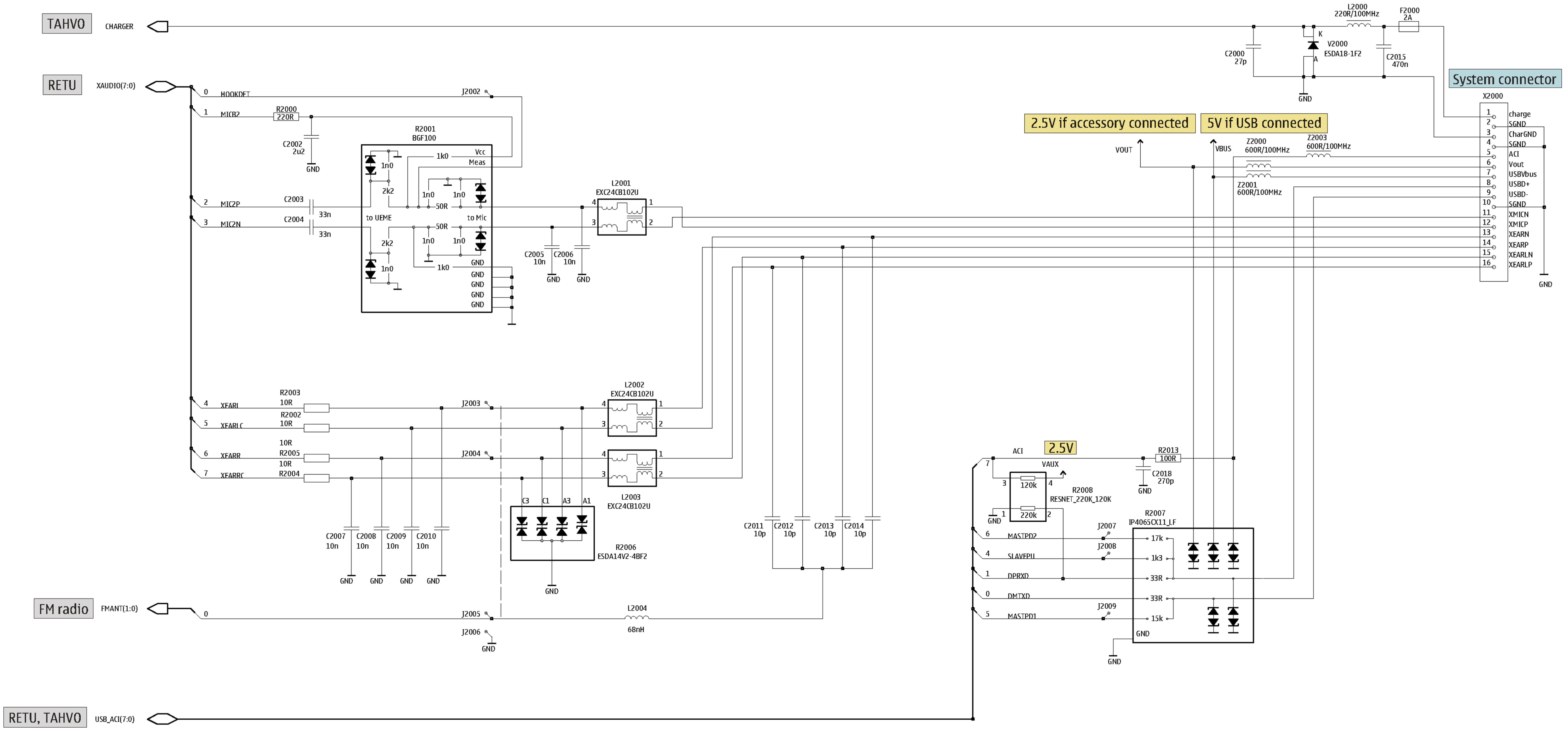
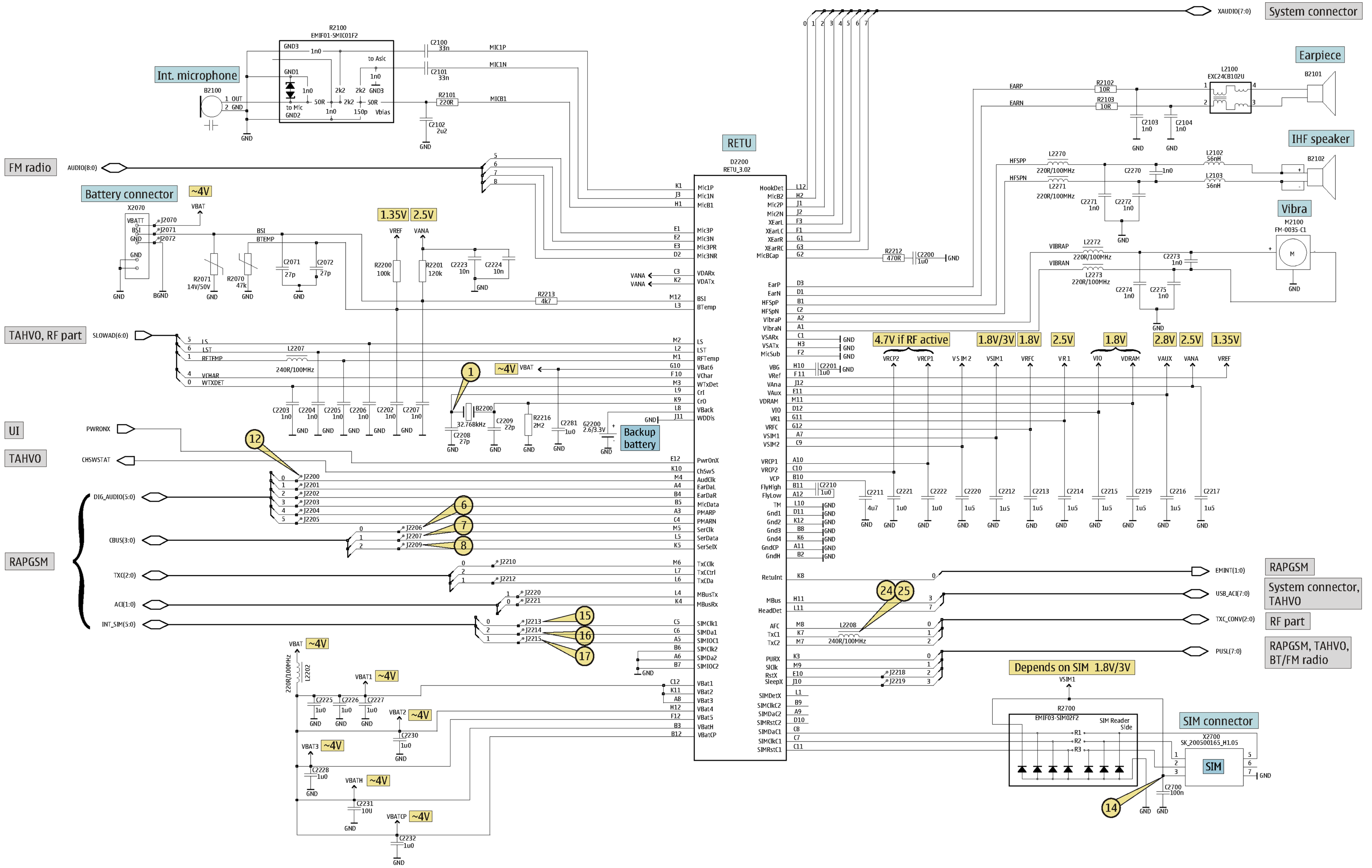
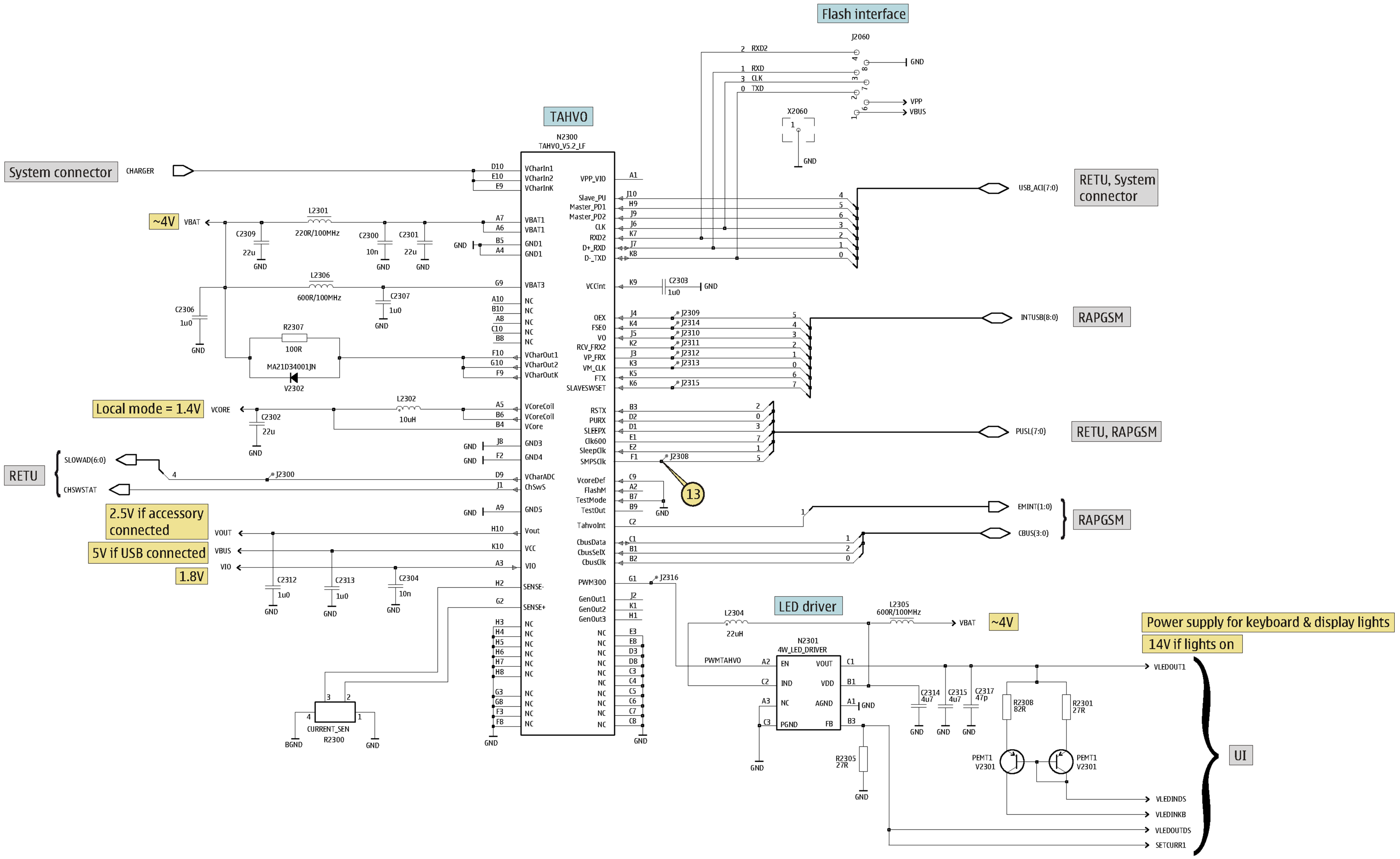
System connector


TAHVO
CHARGER
RETU
XAUDIO(7:0)
0 HOOKDET
1 MICB2
2 MIC2P
3 MIC2N
R2000 220R
C2002 2u2
GND
R2001 BGF100
1n0
2k2
1k0
Vcc
Meas
50R
to UEME
to Mic
C2003 33n
C2004 33n
C2005 10n
C2006 10n
L2001 EXC24CB102U
J2002
4 XEARL
5 XEARLC
6 XEARR
7 XEARRC
R2003 10R
R2002 10R
R2005 10R
R2004 10R
J2003
J2004
L2002 EXC24CB102U
L2003 EXC24CB102U
C3 C1 A3 A1
R2006 ESDA14V2-4BF2
C2007 10n
C2008 10n
C2009 10n
C2010 10n
C2011 10p
C2012 10p
C2013 10p
C2014 10p
FM radio
FMANT(1:0)
J2005
J2006
L2004 68nH
RETU, TAHVO
USB_ACI(7:0)
L2000 220R/100MHz
F2000 2A
C2000 27p
V2000 ESDA18-1F2
K
A
C2015 470n
System connector
X2000
2.5V if accessory connected
5V if USB connected
VOUT
VBUS
Z2000 600R/100MHz
Z2001 600R/100MHz
Z2003 600R/100MHz
1 charge
2 SGND
3 CharGND
4 SGND
5 ACI
6 Vout
7 USBVbus
8 USBD+
9 USBD-
10 SGND
11 XMICN
12 XMICP
13 XEARN
14 XEARP
15 XEARLN
16 XEARLP
ACI
2.5V
VAUX
R2013 100R
C2018 270p
120k
220k
R2008 RESNET_220K_120K
R2007 IP4065CX11_LF
6 MASTPD2
4 SLAVEPU
1 DPRXD
0 DMTXD
5 MASTPD1
J2007
J2008
J2009
17k
1k3
33R
15k

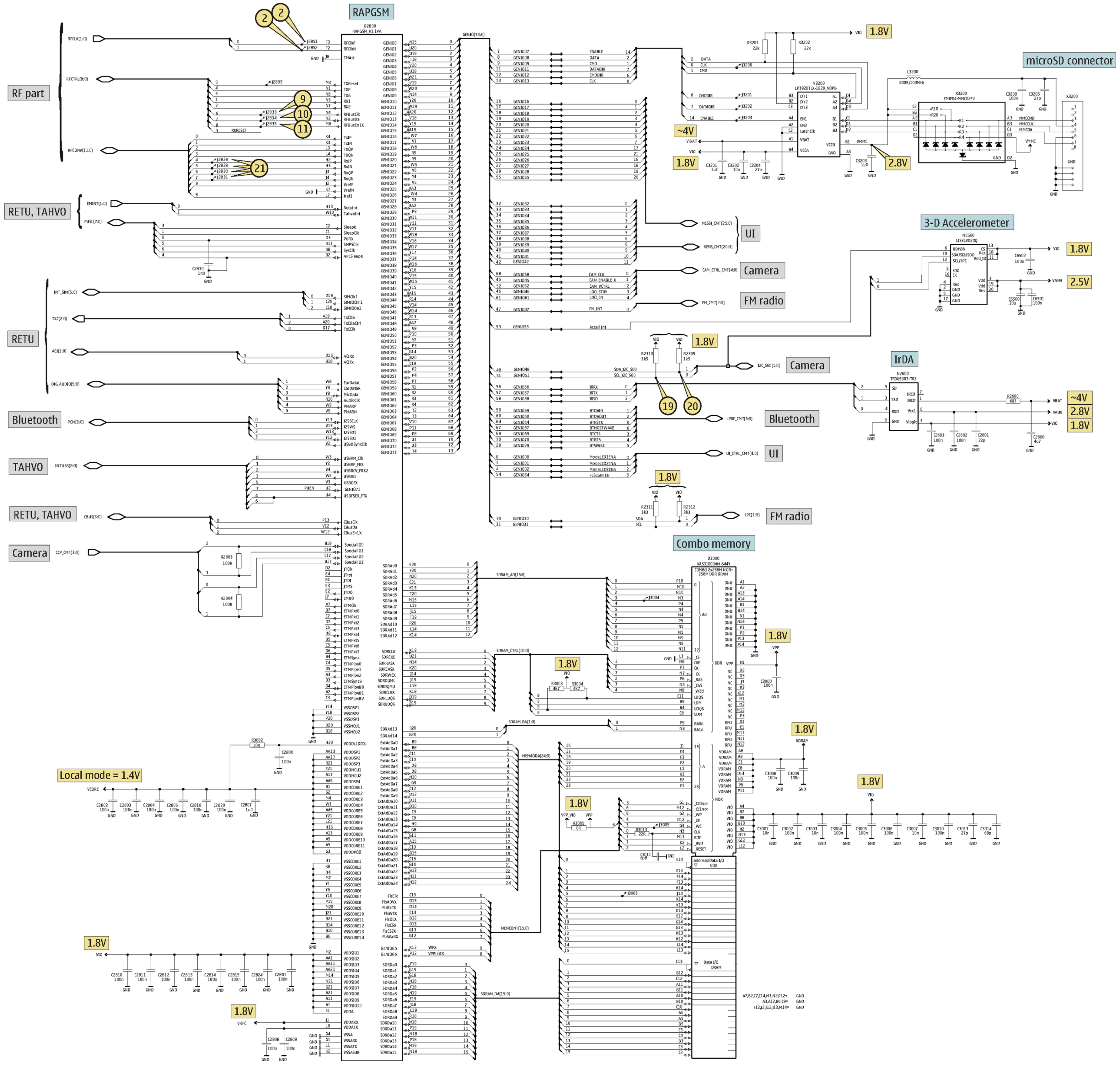
RETU, SIM, Audio


System connector
XAUDIO(7:0)
Earpiece
B2101
L2100
EXC24CB102U
R2102 10R
R2103 10R
EARP
EARN
C2103 1n0
C2104 1n0
IHF speaker
B2102
L2102 56nH
L2103 56nH
HFSPP
HFSPN
L2270 220R/100MHz
L2271 220R/100MHz
C2270 1n0
C2271 1n0
C2272 1n0
Vibra
M2100
FM-0035-C1
VIBRAP
VIBRAN
L2272 220R/100MHz
L2273 220R/100MHz
C2273 1n0
C2274 1n0
C2275 1n0
Int. microphone
B2100
R2100
EMIF01-SMIC01F2
to Asic
to Mic
Vbias
C2100 33n
C2101 33n
C2102 2u2
R2101 220R
MIC1P
MIC1N
MICB1
RETU
D2200
RETU_3.02
FM radio
AUDIO(8:0)
Battery connector
~4V
VBAT
X2070
VBATT
BSI
BTEMP
R2071 14V/50V
R2070 47k
C2071 27p
C2072 27p
BGND
1.35V
2.5V
VREF
VANA
R2200 100k
R2201 120k
C2223 10n
C2224 10n
R2213 4k7
R2212 470R
C2200 1u0
TAHVO, RF part
SLOWAD(6:0)
L2207 240R/100MHz
C2203 1n0
C2204 1n0
C2205 1n0
C2206 1n0
C2202 1n0
C2207 1n0
B2200 32.768kHz
C2208 27p
C2209 22p
R2216 2M2
C2281 1u0
G2200 2.6/3.3V
Backup battery
UI
PWRONX
TAHVO
CHSWSTAT
RAPGSM
DIG_AUDIO(5:0)
CBUS(3:0)
TXC(2:0)
ACI(1:0)
INT_SIM(5:0)
J2200
J2201
J2202
J2203
J2204
J2205
J2206
J2207
J2209
J2210
J2212
J2220
J2221
J2213
J2214
J2215
1
6
7
8
12
15
16
17
24
25
14
L2202 220R/100MHz
VBAT1
VBAT2
VBAT3
VBATH
VBATCP
C2225 1u0
C2226 1u0
C2227 1u0
C2228 1u0
C2230 1u0
C2231 10U
C2232 1u0
4.7V if RF active
1.8V/3V
1.8V
2.5V
1.8V
2.8V
2.5V
1.35V
VRCP2
VRCP1
VSIM2
VSIM1
VRFC
VR1
VIO
VDRAM
VAUX
VANA
VREF
C2201 1u0
C2210 1u0
C2211 4u7
C2221 1u0
C2222 1u0
C2220 1u5
C2212 1u5
C2213 1u5
C2214 1u5
C2215 1u5
C2219 1u5
C2216 1u5
C2217 1u5
EMINT(1:0)
RAPGSM
USB_ACI(7:0)
System connector, TAHVO
TXC_CONV(2:0)
RF part
PUSL(7:0)
RAPGSM, TAHVO, BT/FM radio
L2208 240R/100MHz
J2218
J2219
Depends on SIM 1.8V/3V
VSIM1
R2700
EMIF03-SIM02F2
SIM Reader Side
SIM connector
X2700
SK_200500165_H105
SIM
C2700 100n
GND

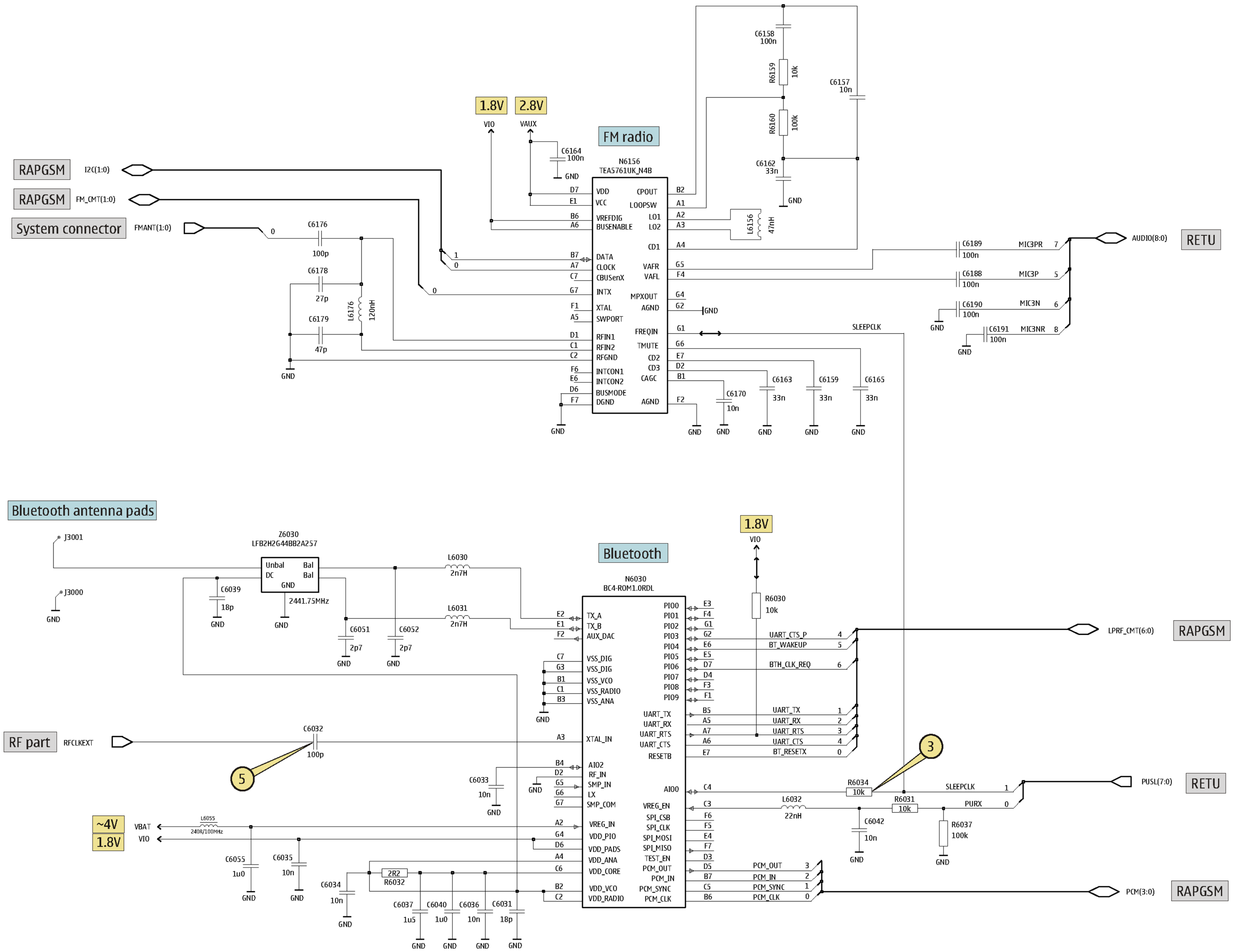
TAHVO


Flash interface
J2060
RXD2
RXD
CLK
TXD
GND
VPP
VBUS
X2060
TAHVO
N2300
TAHVO_V5.2_LF
System connector
CHARGER
~4V
VBAT
L2301
220R/100MHz
C2309
22u
C2300
10n
C2301
22u
L2306
600R/100MHz
C2307
1u0
C2306
1u0
R2307
100R
MA21D34001JN
V2302
Local mode = 1.4V
VCORE
C2302
22u
L2302
10uH
RETU
SLOWAD(6:0)
CHSWSTAT
J2300
2.5V if accessory connected
VOUT
5V if USB connected
VBUS
1.8V
VIO
C2312
1u0
C2313
1u0
C2304
10n
CURRENT_SEN
R2300
BGND
GND
VCharIn1
VCharIn2
VCharInK
VBAT1
GND1
VBAT3
NC
VCharOut1
VCharOut2
VCharOutK
VCoreCoil
VCore
GND3
GND4
VCharADC
ChSwS
GND5
Vout
VCC
VIO
SENSE-
SENSE+
VPP_VIO
Slave_PU
Master_PD1
Master_PD2
CLK
RXD2
D+_RXD
D-_TXD
VCCint
C2303
1u0
OEX
FSEO
VO
RCV_FRX2
VP_FRX
VM_CLK
FTX
SLAVESWSET
RSTX
PURX
SLEEPX
Clk600
SleepClk
SMPSClk
VcoreDef
FlashM
TestMode
TestOut
TahvoInt
CbusData
CbusSelX
CbusClk
PWM300
GenOut1
GenOut2
GenOut3
J2309
J2314
J2310
J2311
J2312
J2313
J2315
J2308
J2316
13
RETU, System connector
USB_ACI(7:0)
RAPGSM
INTUSB(8:0)
RETU, RAPGSM
PUSL(7:0)
EMINT(1:0)
CBUS(3:0)
LED driver
L2304
22uH
L2305
600R/100MHz
~4V
PWMTAHVO
N2301
4W_LED_DRIVER
EN
IND
NC
PGND
VOUT
VDD
AGND
FB
C2314
4u7
C2315
4u7
C2317
47p
R2308
82R
R2301
27R
R2305
27R
PEMT1
V2301
Power supply for keyboard & display lights
14V if lights on
VLEDOUT1
VLEDINDS
VLEDINKB
VLEDOUTDS
SETCURR1
UI

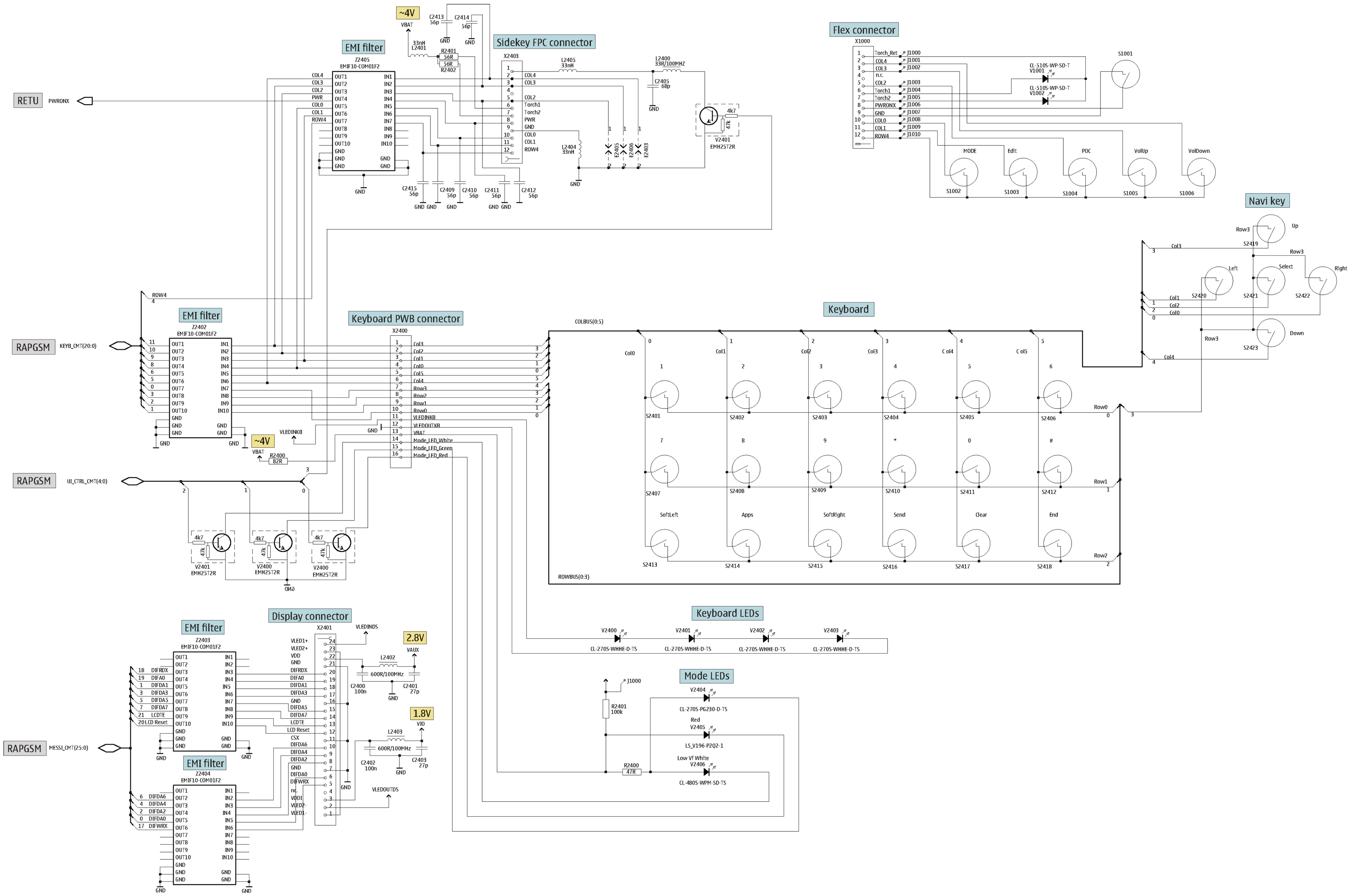
RAPGSM, Combo memory, IrDA


RAPGSM
D2800
RAPGSM_V1.1PA
RF part
RETU, TAHVO
RETU
Bluetooth
TAHVO
RETU, TAHVO
Camera
Local mode = 1.4V
1.8V
1.8V
microSD connector
~4V
1.8V
2.8V
UI
Camera
FM radio
3-D Accelerometer
1.8V
2.5V
1.8V
Camera
IrDA
~4V
2.8V
1.8V
19
20
Bluetooth
UI
1.8V
FM radio
Combo memory
1.8V
1.8V
1.8V
1.8V
1.8V
2
2
9
10
11
21

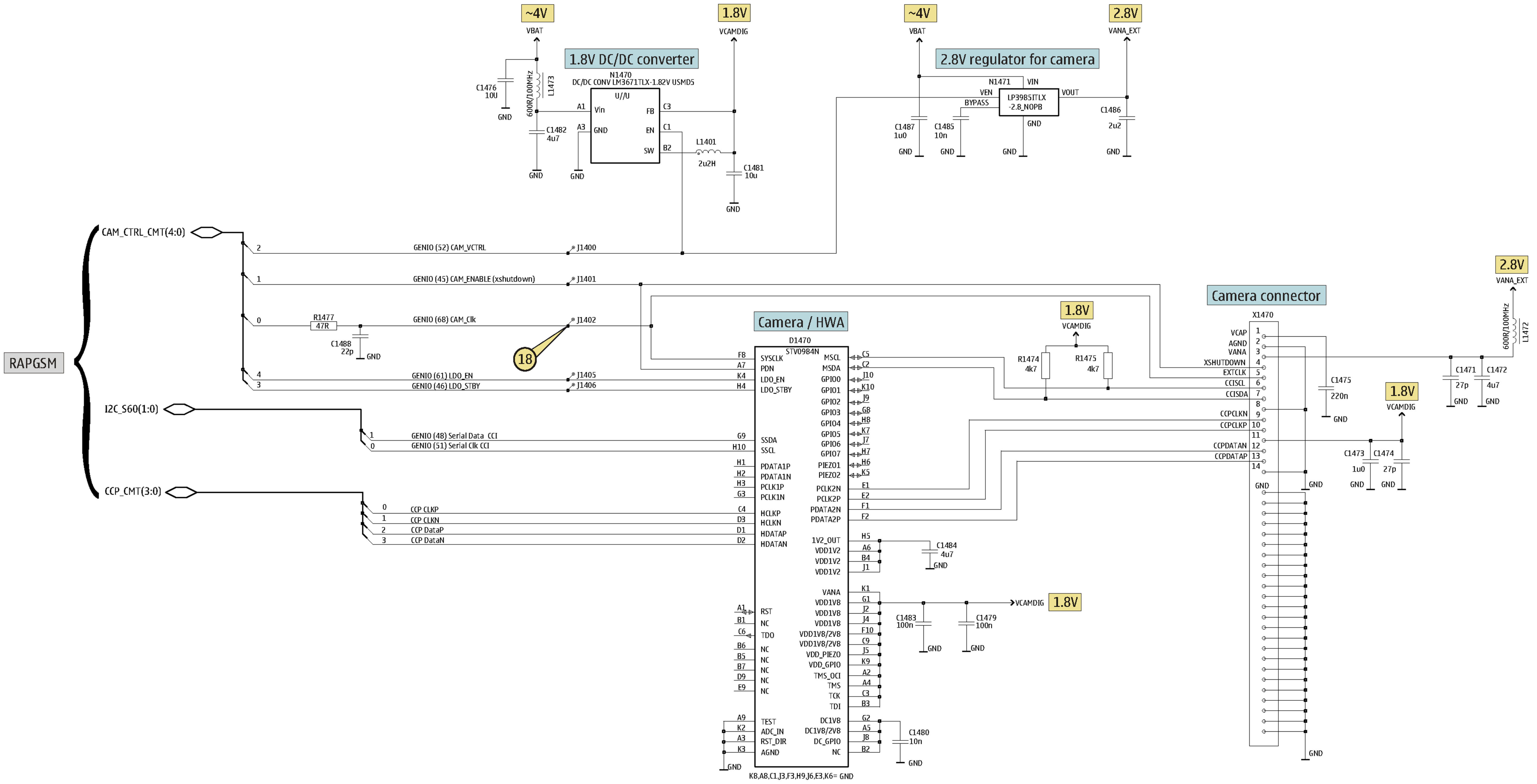
FM radio, Bluetooth


1.8V
VIO
2.8V
VAUX
FM radio
C6164
100n
GND
N6156
TEA5761UK_N4B
VDD
VCC
VREFDIG
BUSENABLE
DATA
CLOCK
CBUSenX
INTX
XTAL
SWPORT
RFIN1
RFIN2
RFGND
INTCON1
INTCON2
BUSMODE
DGND
CPOUT
LOOPSW
LO1
LO2
CD1
VAFR
VAFL
MPXOUT
AGND
FREQIN
TMUTE
CD2
CD3
CAGC
AGND
C6158
100n
R6159
10k
R6160
100k
C6162
33n
C6157
10n
L6156
47nH
RAPGSM
I2C(1:0)
RAPGSM
FM_CMT(1:0)
System connector
FMANT(1:0)
C6176
100p
C6178
27p
C6179
47p
L6176
120nH
GND
C6189
100n
MIC3PR
C6188
100n
MIC3P
C6190
100n
MIC3N
C6191
100n
MIC3NR
AUDIO(8:0)
RETU
SLEEPCLK
C6170
10n
C6163
33n
C6159
33n
C6165
33n
Bluetooth antenna pads
J3001
J3000
Z6030
LFB2H2G44BB2A257
Unbal
DC
Bal
Bal
GND
2441.75MHz
C6039
18p
L6030
2n7H
L6031
2n7H
C6051
2p7
C6052
2p7
Bluetooth
N6030
BC4-ROM1.0RDL
1.8V
VIO
R6030
10k
TX_A
TX_B
AUX_DAC
VSS_DIG
VSS_DIG
VSS_VCO
VSS_RADIO
VSS_ANA
XTAL_IN
AIO2
RF_IN
SMP_IN
LX
SMP_COM
VREG_IN
VDD_PIO
VDD_PADS
VDD_ANA
VDD_CORE
VDD_VCO
VDD_RADIO
PIO0
PIO1
PIO2
PIO3
PIO4
PIO5
PIO6
PIO7
PIO8
PIO9
UART_TX
UART_RX
UART_RTS
UART_CTS
RESETB
AIO0
VREG_EN
SPI_CSB
SPI_CLK
SPI_MOSI
SPI_MISO
TEST_EN
PCM_OUT
PCM_IN
PCM_SYNC
PCM_CLK
UART_CTS_P
BT_WAKEUP
BTH_CLK_REQ
UART_TX
UART_RX
UART_RTS
UART_CTS
BT_RESETX
LPRF_CMT(6:0)
RAPGSM
R6034
10k
R6031
10k
SLEEPCLK
PURX
PUSL(7:0)
RETU
L6032
22nH
C6042
10n
R6037
100k
PCM_OUT
PCM_IN
PCM_SYNC
PCM_CLK
PCM(3:0)
RAPGSM
RF part
RFCLKEXT
C6032
100p
C6033
10n
~4V
VBAT
1.8V
VIO
L6055
240R/100MHz
C6055
1u0
C6035
10n
C6034
10n
2R2
R6032
C6037
1u5
C6040
1u0
C6036
10n
C6031
18p
3
5

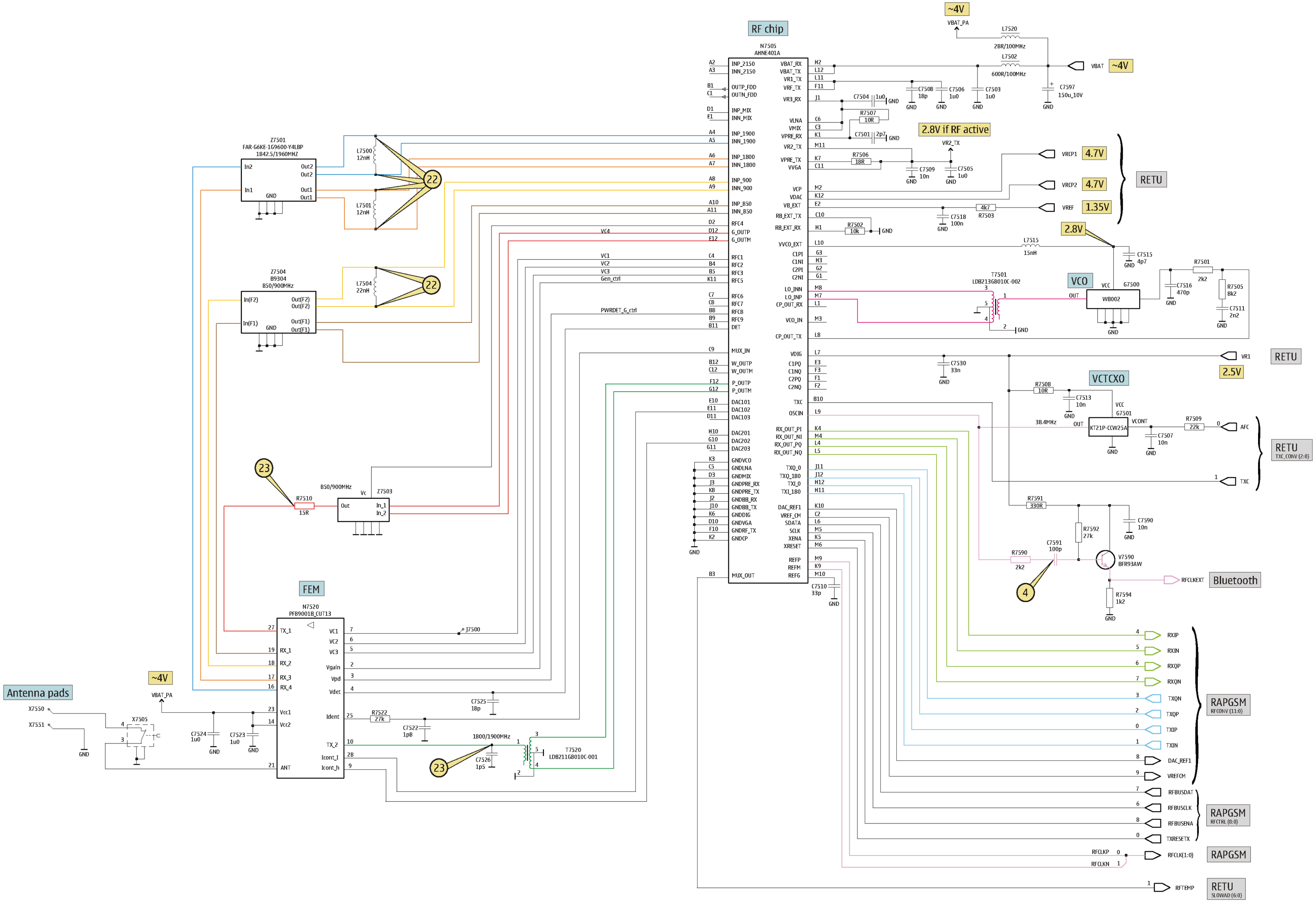
UI


~4V
VBAT
EMI filter
Z2405
EMIF10-COM01F2
Sidekey FPC connector
X2403
RETU
PWRONX
Flex connector
X1000
S1001
MODE
Edit
POC
VolUp
VolDown
S1002
S1003
S1004
S1005
S1006
Navi key
Up
Left
Select
Right
Down
S2419
S2420
S2421
S2422
S2423
EMI filter
Z2402
EMIF10-COM01F2
RAPGSM
KEYB_CMT(20:0)
Keyboard PWB connector
X2400
Keyboard
COLBUS(0:5)
ROWBUS(0:3)
SoftLeft
Apps
SoftRight
Send
Clear
End
RAPGSM
UI_CTRL_CMT(4:0)
V2401
EMH25T2R
V2400
EMH25T2R
V2400
EMH25T2R
Display connector
X2401
2.8V
VAUX
1.8V
VIO
EMI filter
Z2403
EMIF10-COM01F2
EMI filter
Z2404
EMIF10-COM01F2
RAPGSM
MESSI_CMT(25:0)
Keyboard LEDs
V2400
V2401
V2402
V2403
CL-270S-WHHE-D-TS
Mode LEDs
V2404
CL-270S-PG230-D-TS
Red
V2405
LS_V196-P2Q2-1
Low Vf White
V2406
CL-480S-WPM-SD-TS
R2401
100k
R2400
47R
J1000

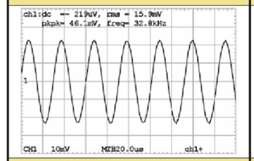
Camera, Earpiece, LCD interface

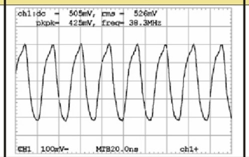

~4V
VBAT
1.8V
VCAMDIG
1.8V DC/DC converter
N1470
DC/DC CONV LM3671TLX-1.82V USMD5
U/U
A1 Vin
A3 GND
FB C3
EN C1
SW B2
C1476 10U
GND
600R/100MHz
L1473
C1482 4u7
GND
GND
L1401 2u2H
C1481 10u
GND
~4V
VBAT
2.8V
VANA_EXT
2.8V regulator for camera
N1471
VIN
VEN
BYPASS
LP3985ITLX -2.8_NOPB
VOUT
GND
C1487 1u0
C1485 10n
C1486 2u2
GND
GND
GND
GND
RAPGSM
CAM_CTRL_CMT(4:0)
2 GENIO (52) CAM_VCTRL J1400
1 GENIO (45) CAM_ENABLE (xshutdown) J1401
0 R1477 47R GENIO (68) CAM_Clk J1402
C1488 22p GND
18
4 GENIO (61) LDO_EN J1405
3 GENIO (46) LDO_STBY J1406
I2C_S60(1:0)
1 GENIO (48) Serial Data CCI
0 GENIO (51) Serial Clk CCI
CCP_CMT(3:0)
0 CCP CLKP
1 CCP CLKN
2 CCP DataP
3 CCP DataN
Camera / HWA
D1470
STV0984N
F8 SYSCLK
A7 PDN
K4 LDO_EN
H4 LDO_STBY
G9 SSDA
H10 SSCL
H1 PDATA1P
H2 PDATA1N
H3 PCLK1P
G3 PCLK1N
C4 HCLKP
D3 HCLKN
D1 HDATAP
D2 HDATAN
A1 RST
B1 NC
C6 TDO
B6 NC
B5 NC
B7 NC
D9 NC
E9 NC
A9 TEST
K2 ADC_IN
A3 RST_DIR
K3 AGND
GND
MSCL C5
MSDA C2
GPIO0 J10
GPIO1 K10
GPIO2 J9
GPIO3 G8
GPIO4 H8
GPIO5 K7
GPIO6 J7
GPIO7 H7
PIEZO1 H6
PIEZO2 K5
PCLK2N E1
PCLK2P E2
PDATA2N F1
PDATA2P F2
1V2_OUT H5
VDD1V2 A6
VDD1V2 B4
VDD1V2 J1
C1484 4u7
GND
VANA K1
VDD1V8 G1
VDD1V8 J2
VDD1V8 J4
VDD1V8/2V8 F10
VDD1V8/2V8 C9
VDD_PIEZO J5
VDD_GPIO K9
TMS_OCI A2
TMS A4
TCK C3
TDI B3
DC1V8 G2
DC1V8/2V8 A5
DC_GPIO J8
NC B2
C1480 10n
GND
K8,A8,C1,J3,F3,H9,J6,E3,K6= GND
C1483 100n
GND
C1479 100n
GND
VCAMDIG
1.8V
1.8V
VCAMDIG
R1474 4k7
R1475 4k7
Camera connector
X1470
VCAP 1
AGND 2
VANA 3
XSHUTDOWN 4
EXTCLK 5
CCISCL 6
CCISDA 7
8
CCPCLKN 9
CCPCLKP 10
11
CCPDATAN 12
CCPDATAP 13
14
GND
GND
GND
C1475 220n
GND
1.8V
VCAMDIG
C1473 1u0
C1474 27p
GND
GND
2.8V
VANA_EXT
600R/100MHz
L1472
C1471 27p
C1472 4u7
GND
GND

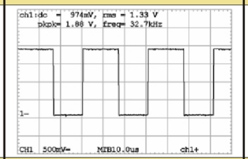
RF part

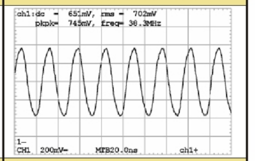

RF chip
N7505
AHNE401A
~4V
VBAT_PA
L7520
28R/100MHz
L7502
600R/100MHz
VBAT
C7597
150u_10V
C7504
C7508 18p
C7506 1u0
C7503 1u0
R7507 10R
C7501 2p7
2.8V if RF active
VR2_TX
R7506 18R
C7509 10n
C7505 1u0
VRCP1 4.7V
VRCP2 4.7V
VREF 1.35V
RETU
R7503 4k7
C7518 100n
R7502 10k
2.8V
L7515 15nH
C7515 4p7
VCO
G7500
WB002
T7501
LDB213G8010C-002
R7501 2k2
C7516 470p
R7505 8k2
C7511 2n2
Z7501
FAR-G6KE-1G9600-Y4LBP
1842.5/1960MHZ
L7500 12nH
L7501 12nH
Z7504
B9304
850/900MHz
L7504 22nH
22
VR1
C7530 33n
2.5V
VCTCXO
R7508 10R
C7513 10n
G7501
KT21P-CCW25A
38.4MHz
R7509 22k
C7507 10n
AFC
TXC
RETU TXC_CONV (2:0)
R7591 330R
R7592 27k
C7590 10n
R7590 2k2
C7591 100p
V7590 BFR93AW
R7594 1k2
RFCLKEXT
Bluetooth
4
23
R7510 15R
850/900MHz
Z7503
C7510 33p
FEM
N7520
PF08001B_CUT13
J7500
Antenna pads
X7550
X7551
X7505
~4V
VBAT_PA
C7524 1u0
C7523 1u0
R7522 27k
C7522 1p8
C7525 18p
1800/1900MHz
C7526 1p5
T7520
LDB211G8010C-001
RXIP
RXIN
RXQP
RXQN
TXQN
TXQP
TXIP
TXIN
DAC_REF1
VREFCM
RAPGSM RFCONV (11:0)
RFBUSDAT
RFBUSCLK
RFBUSENA
TXRESETX
RAPGSM RFCTRL (8:0)
RFCLKP
RFCLKN
RFCLK(1:0)
RAPGSM
RFTEMP
RETU SLOWAD (6:0)
GND

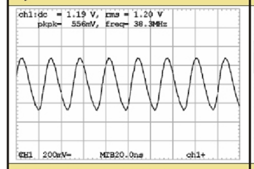
Signal overview

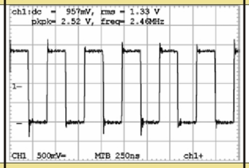

1) 32 kHz at C2208

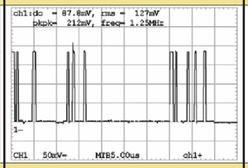

2) RFCLK at J2851, J2852

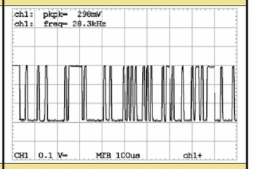

3) SleepCLK at R6034

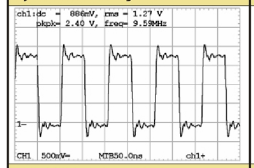

4) VCTCXO 38.4 MHz at C7591

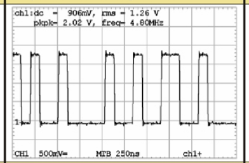

5) RFCLKEXT at C6032

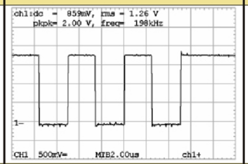

6) CBUSCLK at J2206

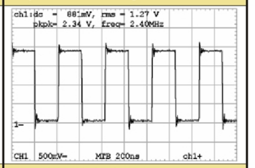

7) CBUSDA at J2207

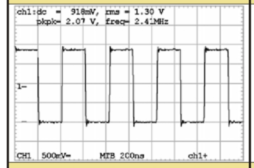

8) CBUSENX at J2209

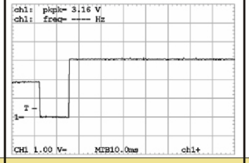

9) RFBUSCLK at J2833

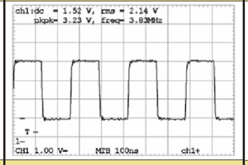

10) RFBUSDA at J2834

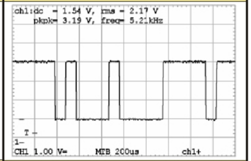

11) RFBUSENX at J2835

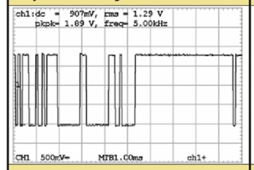

12) AUDIOCLK at J2200

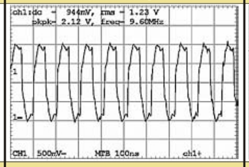

13) SMPSCLK at J2308

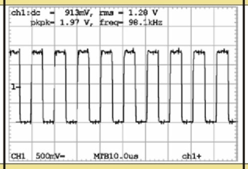

14) VSIM at C2700

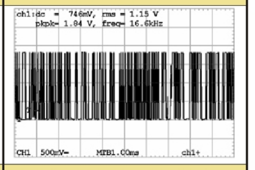

15) SIMCLK at J2213

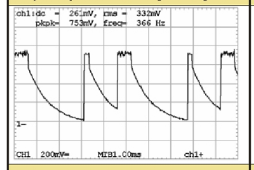

16) SIMDA at J2214

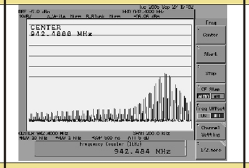

17) SIMIOC at J2215

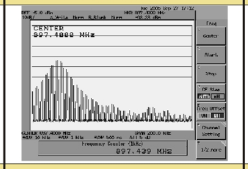

18) CAMERACLK at J1402

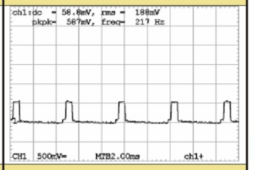

19) CAMERASCL at R2310

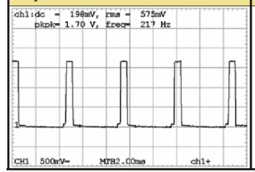

20) CAMERASDA at R2309


21) RXIQ GSM 900 at J2828-J2831


22) RX at L7500, L7501, L7504


23) TX at R7510, C7526

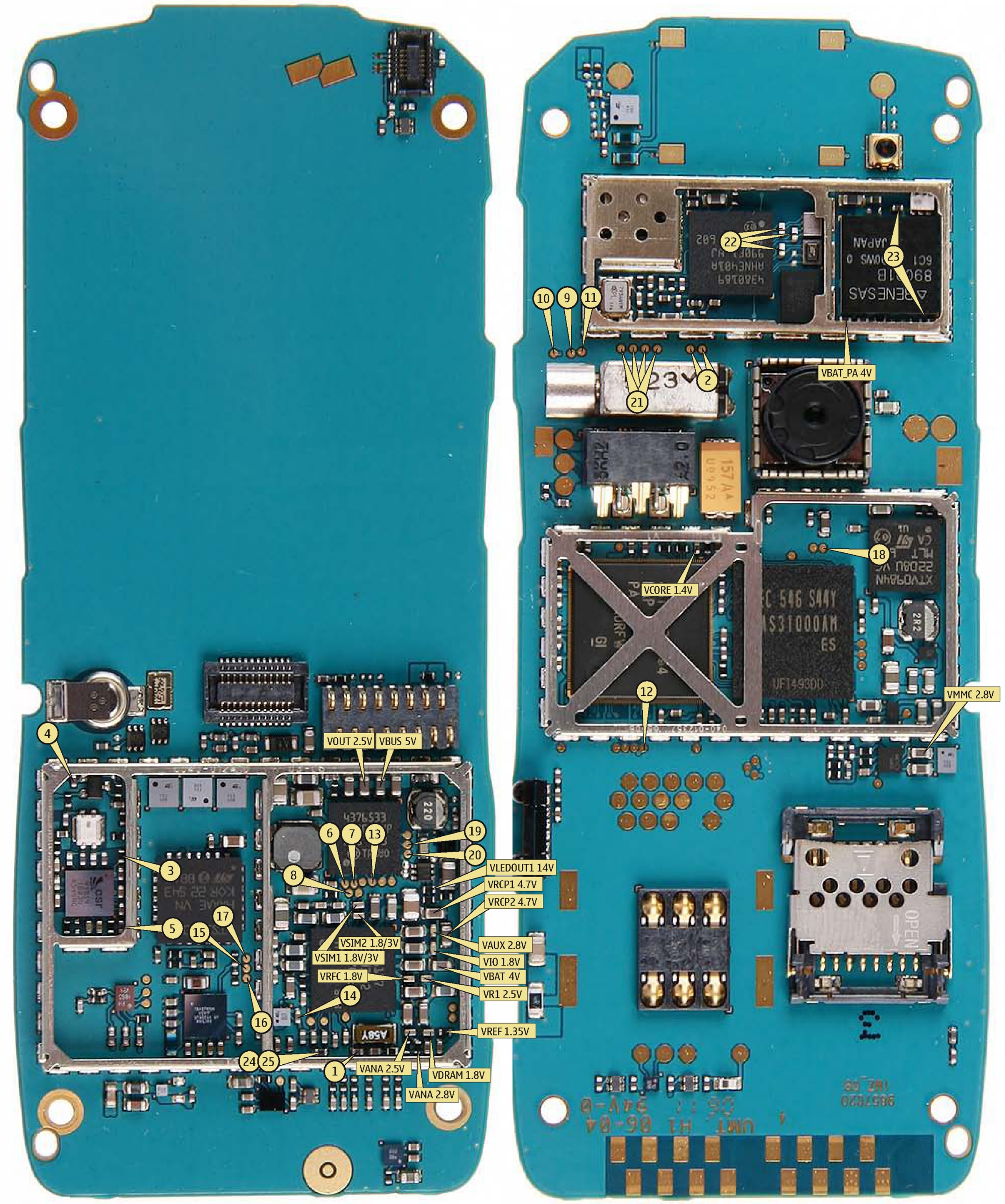

24) TXC GSM900 PL19 at L2208


25) TXC GSM900 PL5 at L2208

26)

27)

28)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21
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23
24
25
VBAT_PA 4V
VCORE 1.4V
VMMC 2.8V
VOUT 2.5V
VBUS 5V
VLEDOUT1 14V
VRCP1 4.7V
VRCP2 4.7V
VSIM2 1.8/3V
VSIM1 1.8V/3V
VRFC 1.8V
VAUX 2.8V
VIO 1.8V
VBAT 4V
VR1 2.5V
VREF 1.35V
VANA 2.5V
VDRAM 1.8V
VANA 2.8V

Component finder

B		C2214	Q7	C2802	J5	C6170	Q3	J2007	Q3	J3200	N2	N6500	P4	R6159	P3
B2200	R6	C2215	P7	C2803	M6	C6176	R3	J2008	Q3	J3201	M5	N7505	E5	R6160	Q3
C		C2216	P7	C2804	J6	C6178	R3	J2009	Q3	J3202	M4	N7520	E2	R7501	E6
C1471	G2	C2217	R7	C2805	J7	C6179	Q3	J2060	N6	J3203	M4	**R**		R7502	D5
C1472	G2	C2219	R7	C2807	J8	C6188	R4	J2070	H8	**L**		R1474	I2	R7503	F5
C1473	I3	C2220	P6	C2808	K8	C6189	R4	J2071	H8	L1401	K2	R1475	I2	R7505	E6
C1474	I4	C2221	P8	C2809	K8	C6190	R5	J2072	I8	L1472	L1	R1477	L6	R7506	E6
C1475	I4	C2222	P7	C2810	J6	C6191	R5	J2200	M6	L1473	L2	R2000	S5	R7507	D5
C1476	L2	C2223	P5	C2811	K5	C6500	04	J2201	M7	L2000	S3	R2001	S5	R7508	E6
C1479	I3	C2224	Q5	C2812	M5	C6501	04	J2202	M7	L2001	S5	R2002	S6	R7509	F6
C1480	I1	C2225	Q7	C2813	L8	C6502	P3	J2203	M6	L2002	S5	R2003	S6	R7510	F2
C1481	K2	C2226	P7	C2814	J8	C7501	D5	J2204	R5	L2003	S7	R2004	S6	R7522	F2
C1482	L2	C2227	P6	C2815	J5	C7503	F6	J2205	R6	L2004	S5	R2005	S6	R7590	M1
C1483	K2	C2228	Q7	C2818	L5	C7504	D5	J2206	06	L2100	C7	R2006	S6	R7591	N2
C1484	I2	C2230	Q7	C2820	M5	C7505	F6	J2207	06	L2102	C7	R2007	Q2	R7592	N2
C1485	M2	C2231	P5	C2824	L6	C7506	F6	J2209	06	L2103	C7	R2008	Q2	R7594	N1
C1486	L2	C2232	P7	C2830	J8	C7507	F6	J2210	R6	L2202	Q8	R2013	Q3	**T**	
C1487	L3	C2270	Q5	C3000	M4	C7508	F6	J2212	M5	L2207	R5	R2070	R1	T7501	E7
C1488	L6	C2271	P5	C3001	M5	C7509	E6	J2213	Q4	L2208	R6	R2071	I8	T7520	D2
C2000	S3	C2272	Q5	C3002	M4	C7510	E6	J2214	Q4	L2270	P5	R2100	T7	**V**	
C2002	S4	C2273	P6	C3003	M5	C7511	E6	J2215	Q4	L2271	Q5	R2101	T7	V2000	S3
C2003	S4	C2274	P6	C3004	M4	C7513	F6	J2218	06	L2272	P6	R2102	S7	V2301	07
C2004	S4	C2275	P5	C3005	K3	C7515	D6	J2219	M8	L2273	P5	R2103	S7	V2302	M5
C2005	S5	C2281	Q8	C3006	M3	C7516	D6	J2220	R8	L2301	N5	R2200	R8	V2400	M3
C2006	S5	C2300	N6	C3007	K3	C7518	F5	J2221	Q8	L2302	05	R2201	R7	V2401	M3
C2007	S6	C2301	N5	C3008	M4	C7522	F3	J2300	06	L2304	N7	R2212	Q5	V7590	N2
C2008	S6	C2302	05	C3009	M3	C7523	D2	J2308	06	L2305	N7	R2213	R7	**X**	
C2009	S6	C2303	N7	C3010	M3	C7524	F3	J2309	07	L2306	M6	R2216	R7	X1470	H4
C2010	S6	C2304	06	C3011	J5	C7525	F1	J2310	07	L2400	M2	R2301	07	X2060	L3
C2011	S7	C2306	M5	C3013	K5	C7526	D2	J2311	07	L2401	C7	R2305	08	X2070	H6
C2012	S6	C2307	N6	C3014	K5	C7530	E6	J2312	07	L2402	M4	R2307	N6	X2400	M7
C2013	S6	C2309	N5	C3200	M3	C7590	N2	J2313	07	L2403	M4	R2308	P7	X2401	L4
C2014	S5	C2312	N6	C3201	M2	C7591	N2	J2314	07	L2404	B8	R2309	N3	X2403	B7
C2015	S3	C2313	N7	C3202	M3	C7597	I5	J2315	07	L2405	C7	R2310	M3	X2700	P6
C2018	Q2	C2314	07	C3203	M2	**D**		J2316	07	L3200	M3	R2311	Q4	X3200	P3
C2071	I8	C2315	08	C3204	M3	D1470	J2	J2828	F6	L6030	02	R2312	Q4	X7505	C2
C2072	R1	C2317	N8	C3205	M3	D2200	Q6	J2829	F6	L6031	01	R2400	L7	**Z**	
C2100	T7	C2400	M4	C6031	N1	D2800	K6	J2830	F6	L6032	01	R2401	B7	Z2000	R2
C2101	T7	C2401	M4	C6032	P2	D3000	K4	J2831	F7	L6156	Q4	R2402	B7	Z2001	R2
C2102	T7	C2402	M4	C6033	P2	**F**		J2833	G7	L6176	R3	R2600	Q8	Z2003	R3
C2103	S7	C2403	M4	C6034	02	F2000	S2	J2834	G8	L7500	D4	R2700	Q5	Z2402	N4
C2104	S7	C2405	C7	C6035	P1	**G**		J2835	G7	L7501	D4	R2803	J6	Z2403	N3
C2200	Q5	C2409	C7	C6036	P2	G2200	L2	J2851	F6	L7502	F5	R2804	J6	Z2404	N4
C2201	Q7	C2410	B7	C6037	P2	G7500	D7	J2852	F5	L7504	E4	R3002	J5	Z2405	B7
C2202	R8	C2411	B7	C6038	01	G7501	F7	J3000	H2	L7515	D6	R3003	L5	Z6030	N2
C2203	R6	C2412	B7	C6039	02	**J**		J3001	H1	**M**		R3004	J5	Z7501	D3
C2204	R6	C2413	C7	C6051	02	J1400	L2	J3003	J7	M2100	G6	R3005	06	Z7503	F4
C2205	R5	C2414	C7	C6052	02	J1401	J3	J3004	K3	**N**		R3013	J5	Z7504	E3
C2206	R6	C2415	C7	C6055	N1	J1402	J3	J3005	J4	N1470	K2	R3200	M1	Z7520	D3
C2207	R7	C2600	P8	C6157	Q4	J1405	L3	J3112	N6	N1471	L2	R3201	M3		
C2208	R6	C2601	N8	C6158	P4	J1406	L3	J3113	N5	N2300	06	R3202	M3		
C2209	R6	C2602	N8	C6159	R4	J2002	S5	J3114	N5	N2301	08	R6030	P2		
C2210	P7	C2603	N8	C6162	Q3	J2003	R6	J3115	N5	N2600	N8	R6031	01		
C2211	P7	C2700	Q5	C6163	Q3	J2004	R6	J3116	N7	N3200	M2	R6032	P1		
C2212	P6	C2800	J5	C6164	R4	J2005	R5	J3117	N6	N6030	02	R6034	02		
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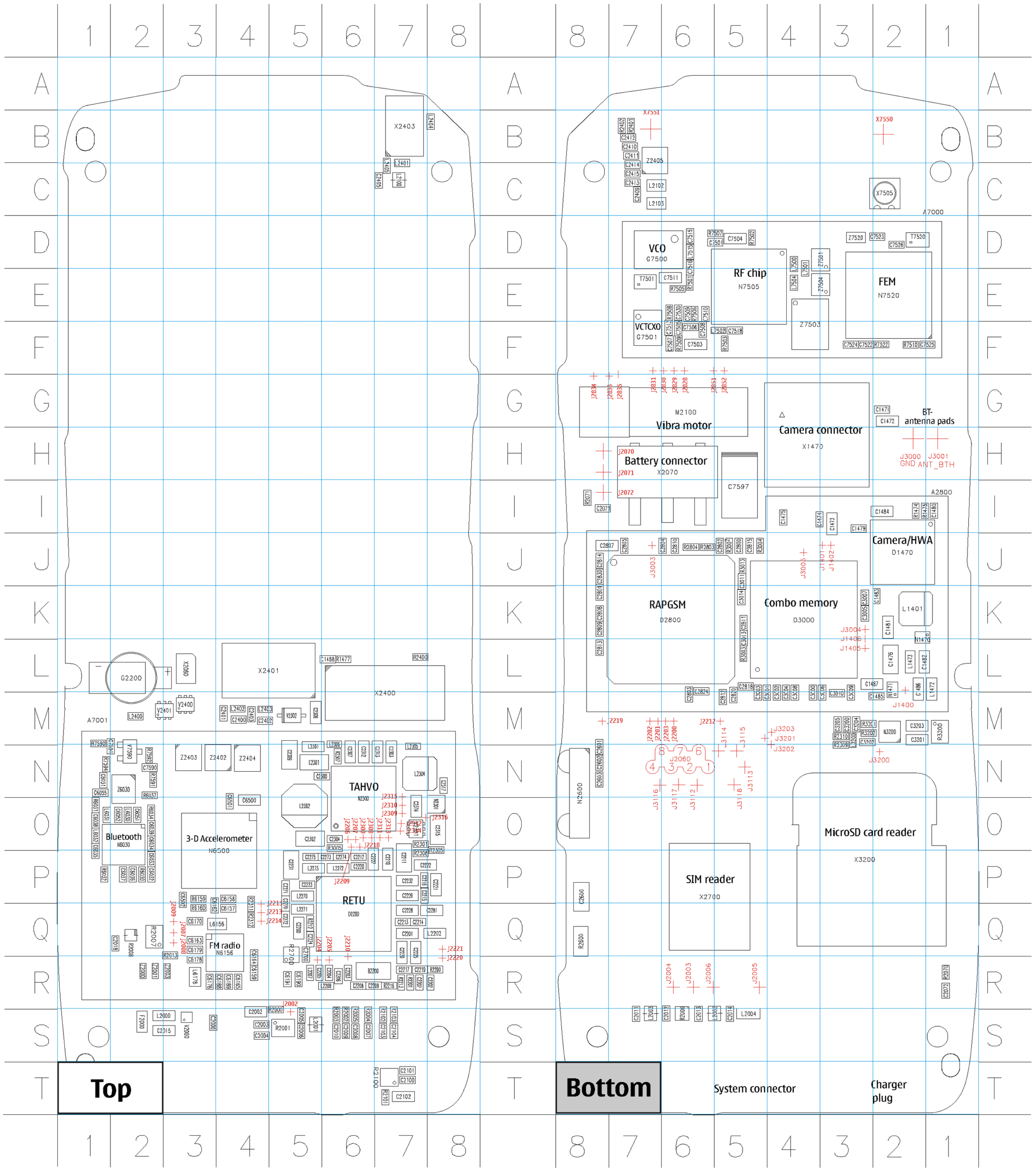
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G2200
A7001
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3-D Accelerometer
N6500
TAHVO
RETU
FM radio
VCO
G7500
RF chip
N7505
FEM
N7520
VCTCXO
G7501
A7000
M2100
Vibra motor
Camera connector
X1470
BT-
antenna pads
J3000 J3001
GND ANT_BTH
Battery connector
X2070
A2600
Camera/HWA
D1470
RAPGSM
D2800
Combo memory
D3000
L1401
MicroSD card reader
X3200
SIM reader
X2700
System connector
Charger
plug

Glossary

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A/D-converter	Analog-to-digital converter
ACI	Accessory Control Interface
ADC	Analog-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic ,type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2,UEME and Zocus
CCP	Compact Camera Port
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSR	cambridge silicon radio
CSTN	Color Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analouge converter
DAC	Digital-to-analouge converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo
DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package

DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evaluation
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compability
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Associasion
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode

LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architechture
OMAP	Operations, maintenance, and administartion part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF PopPort TM	Reduced function PopPortTM interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multi Media Card
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver

SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noice ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP, Official Tiku3G
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WD	Watchdog
XHTML	Extensible hypertext markup language
Zocus	Current sensor, (used to monitor the current flow to and from the battery)